Jan. 5, 1951

What Can Be Done To Improve Streams?

Can Foreign Trade Aid Defense?

What Effect Has Fluid Velocity On Viscosity?

Paper TRADE JOURNAL

CURLATION will upgrade pulp

and...

Save Pulpwood
Save Coal
Save Sulphur
Save Limestone

CURLATION of No. 1 sulphite pulp will

Increase Cleanliness
Increase Softness
Increase Porosity
Increase Strength
Increase Tear

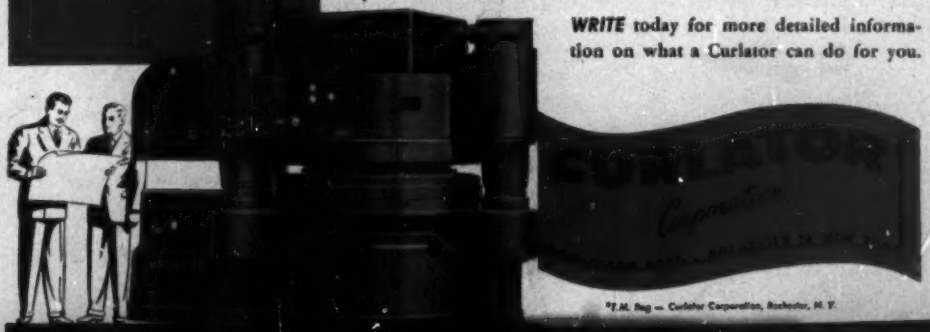
Now, with our Curlator we actually transform glorified screenings into quality pulp!

Before the advent of Curlation there were three grades of pulps: No. 1 sulphite, No. 2 sulphite and fine screenings. *Now* with Curlation there is only *one* grade—*No. 1 sulphite.* Curlation has converted No. 2 sulphite and fine screen rejects into No. 1 sulphite pulp.

Thus the pulp has been upgraded with an increased sales value. Also the yield of No. 1 sulphite has been increased. In addition, savings are being made in coal, limestone and sulphur.

In these days of rising costs and material scarcity the inclusion of a Curlator in your production line is of topmost importance in mill operation.

WRITE today for more detailed information on what a Curlator can do for you.



*T.M. Reg — Curlator Corporation, Rochester, N. Y.

PROVED IN PERFORMANCE

Grinnell-Saunders Diaphragm Valves with KEL-F Diaphragms are living up to every promise made for them! At the right are reports from typical users.

KEL-F's resistance to chemical action, low cold flow, wide range of temperature application and exceptional flex life combine to make it the most important diaphragm development in years. KEL-F is chemically inert to all organic acids and alkalies in all concentrations. It withstands chlorinated aliphatic and aromatic compounds, concentrated nitric, chromic, hydrofluoric and sulphuric acids and most solvents which readily attack rubber and previous synthetic diaphragm materials.

While KEL-F is tough and flexible, it is not resilient. To provide resiliency for proper closure of the valve and to provide added support for the KEL-F diaphragm, it is backed with a rubber cushion. A free-floating method of attachment to the compressor assures an even closing pressure on the entire surface of the weir. A tube nut which floats as the rubber cushion presses down in closing the valve, eliminates excessive pressure on the diaphragm stud. The rubber cushions the closing force, thereby reducing wear and cutting action on the diaphragm. In accelerated tests, a 2-inch valve with a KEL-F diaphragm withstood over 80,000 closures, drop tight, against 80 pounds of air under water with no leakage and no visible signs of wear. Write for complete information.

Typical performance reports . . .

1. Chlorine and HCl gas with small amounts of acetic acid and acetyl chloride at 302° F. for 900 hours. Very much superior to material it replaced.
2. Mixed aromatic and ketone solvents at 230° F. and 10 psi for three months. No sign of deterioration.
3. Chlorinated organic chemical at 158 to 194° F. and 30 to 40 psi for nine months. No failure, no shutdown, no replacement.
4. Chromyl chloride at ambient temperature and 15 psi. Diaphragm condition good at end of thirty days' test.
5. Liquid chloral saturated with HCl at 158° F. for 408 hours. Well satisfied — have placed orders for additional diaphragms.

*"KEL-F" is the registered trade name for polytrifluorochlorethylene, an exceptionally stable thermoplastic. It is produced by the M. W. Kellogg Co.

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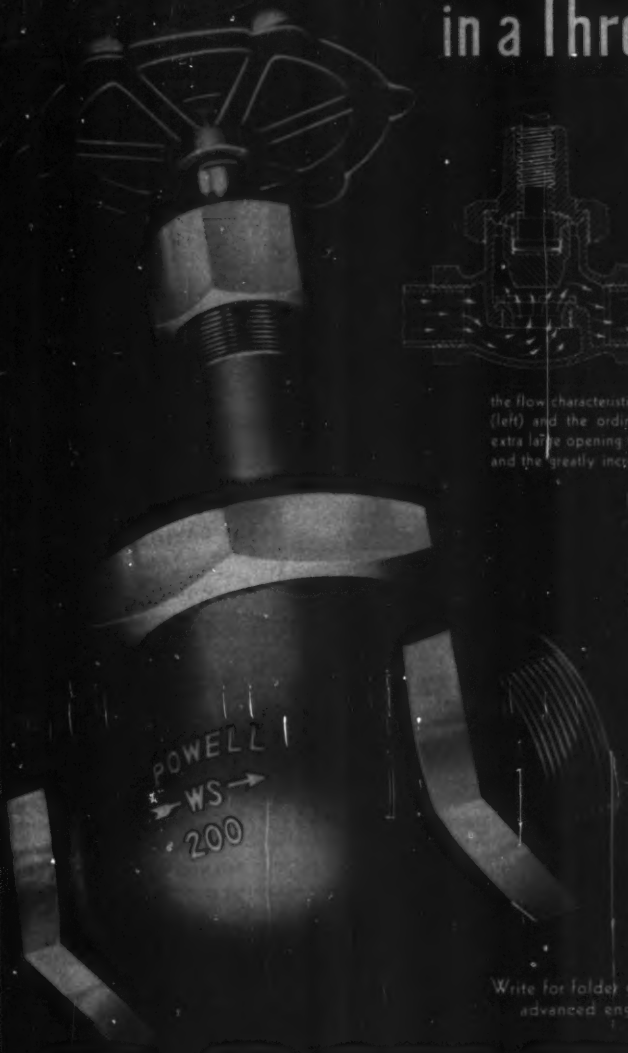
POWELL gives you *Full-Flow* in a Throttling Valve



COMPARE
the flow characteristics of the new Powell "W.S." Valve (left) and the ordinary globe valve (right). Note the extra large opening through the seat (nominal pipe size) and the greatly increased lift of disc, when wide open.

This is actually a dual service valve in that it can be throttled to any desired degree, yet, when wide open, permits FULL FLOW through the body. Thus turbulence and pressure drop are reduced to a minimum—a triumph in engineering that exemplifies Powell's continual leadership in the field of industrial valve design.

Powell "W.S."
Bronze Globe Valve
Fig. 2608

Write for folder giving full description of the many advanced engineering features of this valve.

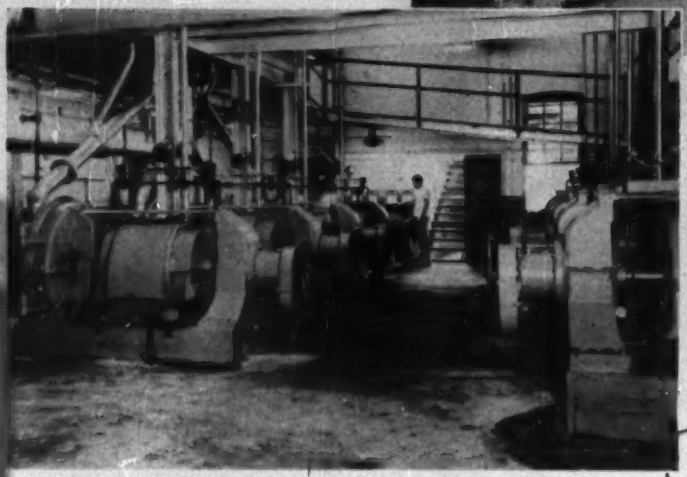
POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio

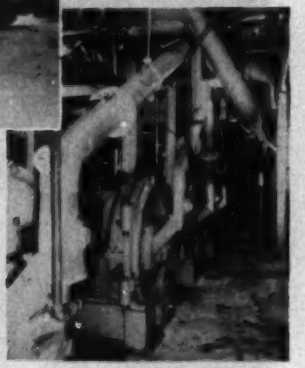
Mills that compare Refiners

Front view of primary stage 400 H. P. refiners. First two units operating on shredded knots and screenings . . . note discharge spout from shredders.

Last three units operating on semi-chemical chips . . . note flexible dilution water lines and electric cable—swing head door side.



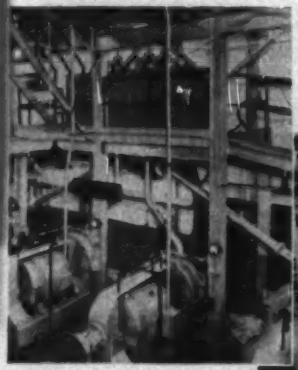
Four 300 H. P. secondary refiners (on left) . . . note stock inlet piping—lubrication oil-flow indicators, and compact arrangement of instrument panel.



Front view—secondary stage refiners, showing stock inlet piping arrangement . . . note dilution water line at refiner intake.

The GAYLORD Installation
A battery of 9 Sprout-Waldron Refiners at the Bogalusa, La. plant of Gaylord Container Corp.

choose Sprout-Waldron

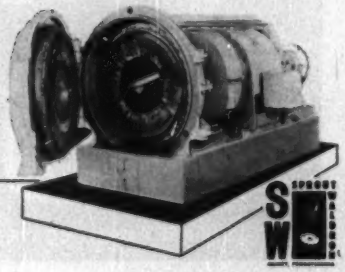


Individual view of secondary stage refiner illustrating stock handling system from regulating box to refiner . . . note ammeter, dial indicator and oil flow indicators.

Top view—primary stage refiners. Two units in foreground on semi-chem chips . . . note dewatering unit directly overhead.

Two units at extreme end operating on knots and screenings . . . note Jeffery shredders located directly above. Note dial indicators—tail end.

Sprout-Waldron Refiners, or "Sprouts" as they are dubbed in the industry, are sprouting up in mills all over North America. Let one of our field representatives tell you the facts about the fast-growing popularity of this equipment. Or, write today for Bulletin 41 to Sprout, Waldron & Co., Inc., 59 Waldron St., Muncy, Penna.



—Sprout-Waldron
Manufacturing Engineers
SINCE 1866
MUNCY, PENNSYLVANIA

165

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DATES TO REMEMBER

JANUARY 9: Metropolitan Group, TAPPI, Monthly Meeting, Fraunces Tavern, N. Y. C.

JANUARY 15-18, 1951: Plant Maintenance Show & Conference, Public Auditorium, Cleveland, Ohio.

JANUARY 22-26: Tenth International Heating & Ventilating Exposition, Commercial Museum, Philadelphia, Pa. (Am. Society of Heating & Ventilating Engineers).

JANUARY 24-26: Canadian Pulp & Paper Assn., Mount Royal Hotel, Montreal, Que.

FEBRUARY 19-22: Technical Assn. of Pulp & Paper Industry, Annual Meeting, Hotel Commodore, N. Y. C.

FEBRUARY 19-22: American Paper & Pulp Assn., Annual Meeting, Waldorf-Astoria Hotel, N. Y. C.

FEBRUARY 21: Mass. Institute of Technology Alumni, Annual Luncheon in connection with TAPPI convention; 12:00 noon, Engineer's Club, N.Y.C.

FEBRUARY 21: New York State College of Forestry, Paper and Pulp Alumni: Annual Luncheon, Hendrick Hudson Room, Roosevelt Hotel, N. Y. C.

FEBRUARY 21: University of Maine, Paper and Pulp Alumni: Annual Meeting, Biltmore Hotel, N. Y. C.

NEXT WEEK

The fourth installment of "Viscosity" by Neil MacCoull. Contains additional valuable information on the flow of fluids.

"New Dow Developments for the Paper Industry" by Elmer K. Stilbert, Dow Chemical Co., describes several very interesting products recently developed for use in paper.

"Status of Forestry in the Pulpwood Industry in the Lake States" by G. B. Amidon, Minnesota & Ontario Paper Co., presents a very good picture of the pulpwood supply and demand in the Lake States.

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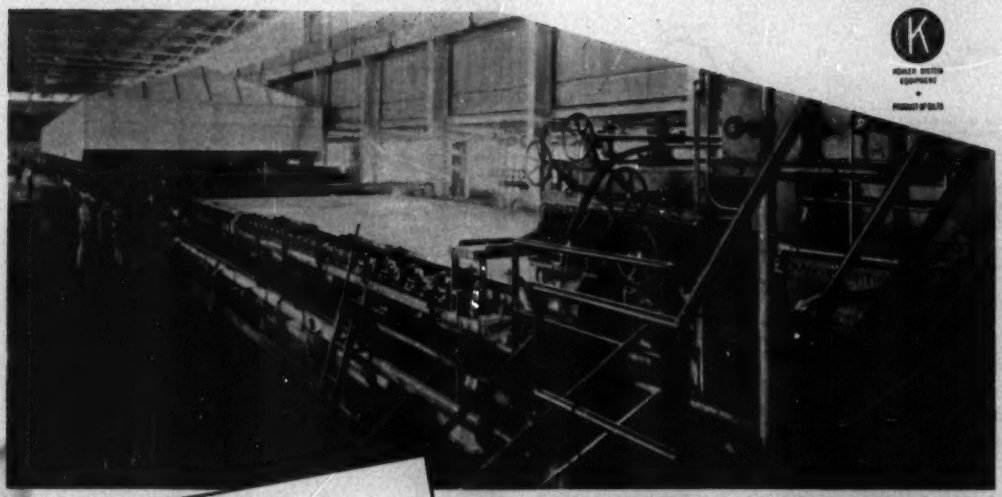
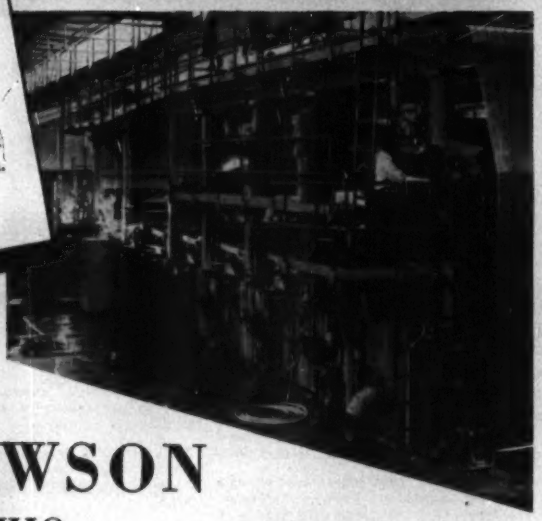


Fourdriniers and Cylinder Machines

Fourdriniers that emphasize the extreme precision so necessary when running condenser and cigarette. Wide Fourdrinier for operation at high speeds.

Cylinder machines so carefully engineered, so painstakingly fabricated and so skillfully erected that they almost invariably make saleable paper within the hour.

Get the Black-Clawson estimate on that new machine or on your rebuilding program.

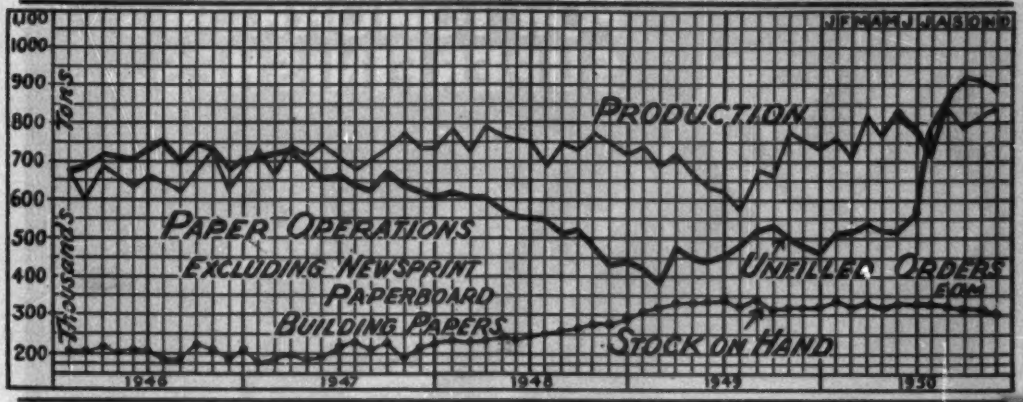


BLACK-CLAWSON

HAMILTON, OHIO

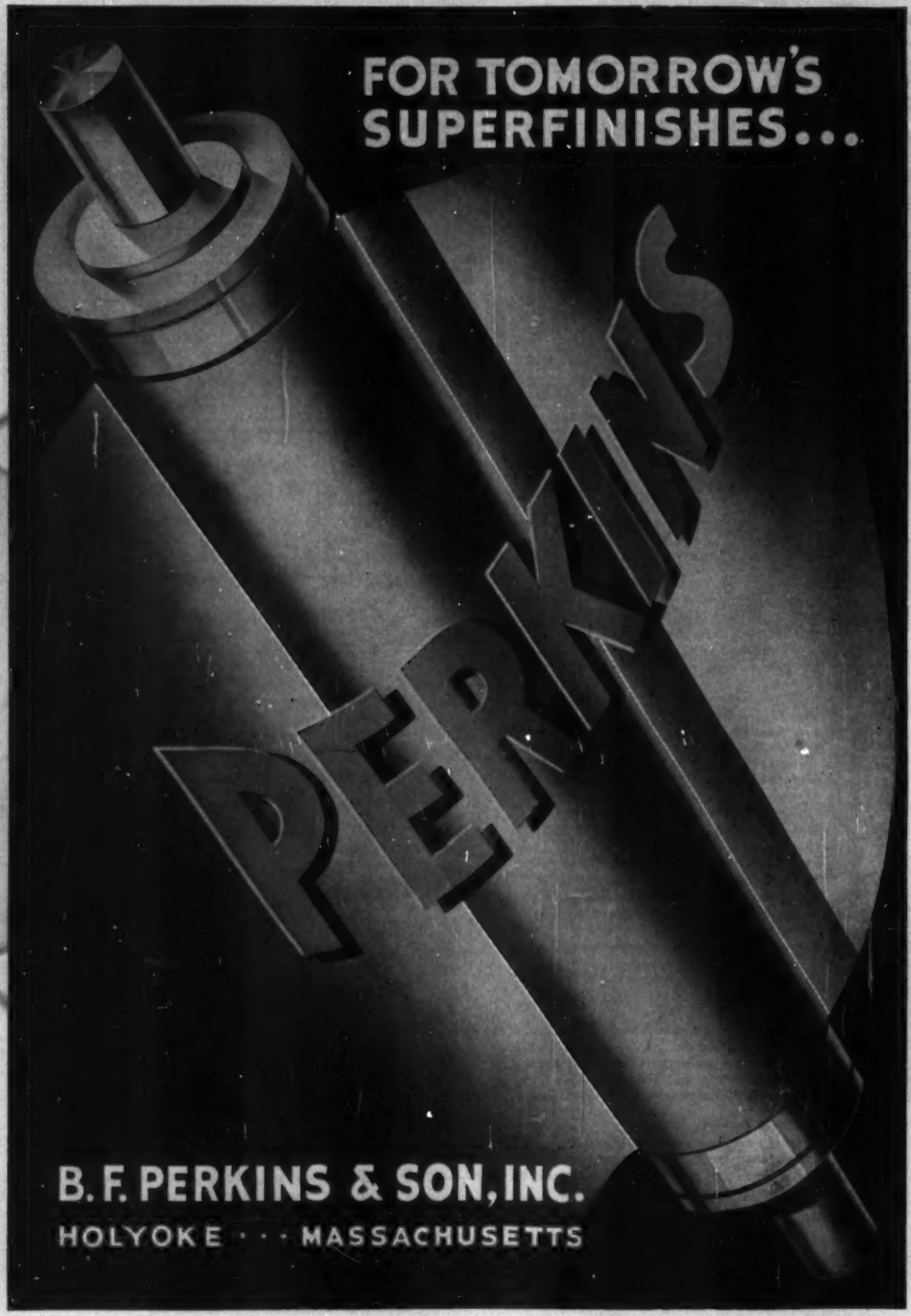
Divisions: SHARTLE BROS. MACHINE CO., Middletown, Ohio
DILTS MACHINE WORKS, Fulton, New York
Western Sales Office: Mayer Bldg., Portland, Oregon
Southern Sales Office: 937 Coventry Road, Decatur, Ga.
Associate: ALEXANDER FLECK LIMITED, Ottawa, Canada
Subsidiary: B-C INTERNATIONAL, LTD., Greener House
66/68 Haymarket, London, S. W. 1, England

OUR BUSINESS



Source	Production	WEEK ENDING Dec. 23, '50	Nov. 25, '50	Dec. 24, '49
APPA	Paper Production percent 6-day Capacity	103.3	102.4	87.9
	Unbl. Kraft Paper Production percent	96.0	96.1	87.5
NPA	Paperboard Operating Ratio percent inch hours	105.0	100.0	92.0
		Nov. 1950	**Oct. 1950**	**Nov. 1949**
APPA	Paper Production* (Except Newsprint and Building Papers) Tons	872,000	865,566	762,099
	New Orders Tons	831,000	869,360	754,993
	Unfilled Orders Tons	869,900	911,147	496,770
	Shipments Tons	872,000	870,497	755,367
		Nov. 1950	**Oct. 1950**	**Nov. 1949**
NPA	Paperboard Production Tons	1,168,958	944,672	882,800
	New Orders Tons	1,225,369	931,828	887,000
	Unfilled Orders Tons	722,046	694,741	429,800
	Our Customers Activities Index[1]	**Latest Mo.***	**Previous Mo.***	**Year Ago***
FRS	Manufactures Total Index	228	225	179
	Durable Mfg. Index	262	254	176
	Nondurable Mfg. Index	201	201	181
	Chemical Products Index	280	272	245
	Mfg. Food Products Index	178	193	177
	Printing and Publishing Index	181	173	169
ODC	Magazine Advg.-Printer's Ink Index	342	338	294
	Retail Sales Combined Adjusted Index	323.3	332.3	294.4
	Drug Index	223.4	227.8	220.0
	General Merchandise Group Index	299.2	321.5	273.9
	Grocery and Combination Index	394.7	391.2	358.8
	Prices Index			
BLS	Consumers Price Index[1]	174.8	173.8	168.5
	Wholesale all Commodities[2]	169.1	169.5	152.2
	Wholesale Foods[2]	172.5	177.2	159.6
	Commodities other than Farm Products and Foods[2]	161.5	159.2	145.0
	Wholesale Pulp and Paper[2]	173.4	167.1	156.5
	Purchasing Power of Dollar, Consumers Prices[1]	47.8	48.0	49.9
	General Activity Index			
FRS	Mfg. Production-Worker Payroll	403.6	393.9	335.1
	Unemployment Compensation Initial Claims (M)	720	558	1,363
	Miscellaneous Carloadings—Thousands of Cars	1,673	1,963	1,277
	Electric Output (Million KW hr.)	34,307	32,650	28,169
PTJ	Average 32 P & P Common Stocks as of Dec. 26	$33.56	$34.67	$29.99
	Average Indicated Dividends Common Stocks as of Dec. 26	$ 2.39	$ 2.57	$ 2.31

[1] 1935-39=100 Unadjusted Index
[2] 1926=100
* For details see APPA Monthly Statistical Summary—October 1950 Estimated Figures
* Latest Month Available on Request


FOR TOMORROW'S
SUPERFINISHES...
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HOLYOKE · · · MASSACHUSETTS

Paper TRADE JOURNAL

TRENDS

Office of the PAPER TRADE JOURNAL,
Wednesday, January 3, 1951.

NPA Asks Voluntary Conservation

Containers and packaging users have entered an era wherein they may not be able to procure the type of container they normally would use were all materials in full supply. Industrial mobilization will take an increasingly larger bite of already short raw materials supplies. Some disruption will result, shifts to substitutes, also increased re-use and development of ways and means of effecting maximum packaging out of less materials, says the Commerce Department in its quarterly report on Containers and Packaging.

Calling for voluntary conservation in the use of basic raw materials and finished containers, the NPA asks that producers and users alike undertake to effect savings in the following ways:

Do not overpackage. Try to redesign containers, particularly those of fiber boards, to use less board. Keep packing adequate but no more than adequate.

Use the largest container practical. The fiberboard contained problem will be reduced if everyone packs in fewer but larger containers designed to the practical irreducible minimum.

Get maximum re-use from containers. A direct request is made to producers, suppliers and customers to find ways and means where through special "spot," "strip" or tape seal, fiberboard containers can be closed sufficiently well to carry, yet be opened without damaging the box so that it can be collapsed, returned and re-used. Container re-use is most important to the whole industry.

Proper salvage. Paper and fiberboard demand on pulp production has outrun supply. Waste paper supply must be kept high. Kraft waste—paper, bags, and board—should be segregated from miscellaneous waste papers and sold as waste kraft.

Do not order more containers than immediate, minimum requirements. To require a delivery date far ahead of time of intended actual use may adversely affect the entire container supply.

Container Output Depletes Materials Supply

Demand for container and packaging materials in the period immediately following the Korean emergency propelled output to an all-time high. Factors which contributed to this development included the prior reduction of inventories below normal levels by container producers and users during 1949 and stepped up military purchases. Furthermore, the drain on raw material supplies reduced deliveries to container producers and made operations difficult.

Despite these developments, container producers increased output from 10 to 45 percent during the third quarter, in most instances at the expense of raw material inventories. Total output of liners was 24.7 percent higher than in 1949's quarter. Corrugating material production was at the same rate of increase, while container, chip and filler board output gained 32.6 percent.

Fiber box demand for the quarter was stimulated by military requirements for weatherproof, corrugated and solid fiber shipping containers, a demand which, in all probability, will increase during the next quarter.

Folding and Set-up Boards

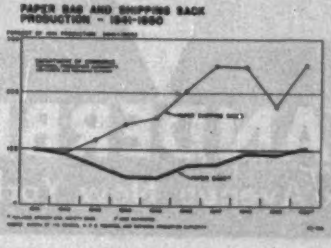
Demand for folding paper boxes during the third quarter exceeded the ability of manufacturers to obtain raw materials. If paper and boards had been available, most producers could have increased their shipments. Production of folding boxboards increased to 652,631 tons from the second quarter, for a gain of 19.7 percent. First quarter 1951 folding box business is expected to be on a higher level than 1950 and 1949's periods.

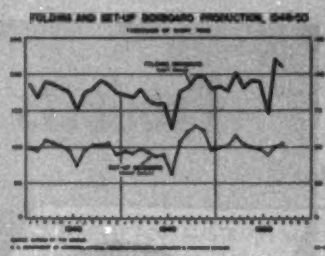
Abnormal backlogs in set-up paper boxes are expected to diminish after the holidays. Increase in demand is thought to have about run its course. Production of set-up boxboards gained 25.8 percent in July, dropped 6.8 percent in August, and again dropped 14.2 percent in September, for a quarterly loss of 142,605 tons or 2.8 percent over 1949's quarter. This also represents a 3.2 percent decrease from the second quarter 1950 output.

It would appear that box producers depleted their inventories of raw materials to increase shipments. Reported is a shift to lower grade stocks and the use of lighter-weight boards.

Steady Gain in Shipping Sack Demand

A steady increase in demand for multi-wall paper shipping sacks has been evident since July with the gain for the third quarter standing at 16.2 percent, or 169,921 tons over 1949's quarter. Producers are operating at capacity, it is reported, with order backlogs ranging from 60 to 90 days.





Still further pressure of demand is anticipated from the fertilizer industry in view of the severe shortages of burlap supplies and approaching peak season for that industry.

Another trend being watched in the South and Southeastern areas is the increase in use of crepe containers which are said to be supplanting the regular multiwall container in many lines. These "crepes," though more expensive than the regular multiwall, are said to be more desirable for rough handling due to the "give" of the material.

Inventory Building In Bags Noted

Considerable inventory building at the customer level was believed to be included in the heavy demand for paper bags — grocery and variety. Substantial gains were noted during the third quarter. Production of 185,600 tons was 1.3 percent higher than the 183,290 tons of the second quarter and 29.2 percent ahead of 1949's third quarter.

Fibre Cans, Tubes and Drums

Fiber can and tube production increased about 20 percent over a year ago. "DO" orders for ammunition containers are helping producers to obtain raw materials which are becoming increasingly tight. Industry total capacity is reported to be about 30 percent greater than production. Demand for fiber drums continues to gain, with raw material supplies the limiting factor to increased production.

Materials

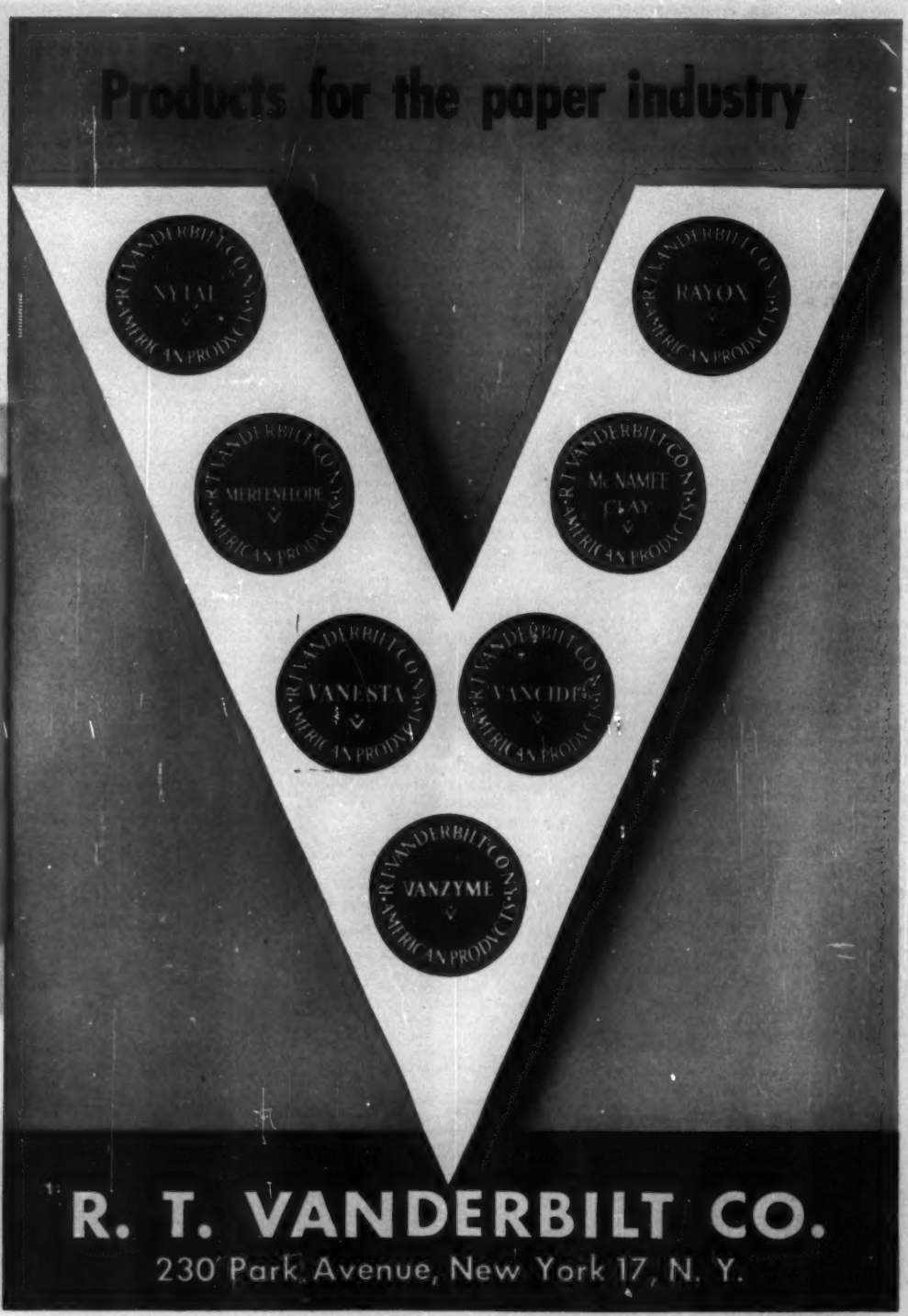
Casein.— Market active, supplies light and closely held. Prices up ½ cent, some higher. Heavy buying from U. S. and other countries has reportedly cleaned up Argentine stocks to February.

Twines, Hard Fibre.— Sharp advances in the costs of hard fibers, particularly sisals, is held responsible for price rises in hard fiber twines, which average 5½ cents a pound. —E. P. N.

Paperboard Production (Tons)*

	Dec. 23 1950	Dec. 16 1950	Dec. 24 1949
Production	241,058	239,164	200,595
New Orders	171,484	204,734	153,405
Unfilled Orders	590,431	661,676	327,641

* Source: NPA.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News of the Week

Paper TRADE JOURNAL

AUSTRIAN MILL MODERNIZATION

WASHINGTON, D. C.—Austria's vital pulp and paper industry will be aided by two Marshall Plan industrial projects. Involving $3,381,000 in ECA dollars, the projects provide for modernization of a pulp and paper mill at Gratwein, producing fine quality papers, and construction of a new kraft pulp and paper mill at Nettingsdorf which will turn out packaging materials.

The mill at Gratwein is owned by Leykam-Josefsthal, A. G., which has been supplying both the Austrian and world markets with products such as writing, drawing and blotting papers, school copy books, paper cup materials and other fine quality papers. The firm is more than 100 years old and the equipment in the mill is old and obsolete.

The ECA dollar financing represents less than 25 percent of the over-all cost of the project, which is estimated at the equivalent of $4,741,000. The ECA dollars, amounting to $1,101,000, will include costs of a paper machine with a trim width of 3,700 mm to be purchased in the United States.

As a result of the modernization project, production of bleached sulphite pulp at the Leykam mill is expected to increase from 25,200 metric tons per year to 31,680 tons, and production of paper from 12,000 metric tons per year to 20,000 tons. At the same time, paper production costs are expected to be cut about 22 percent.

Present plans call for the bulk of the increased production to be exported, which it is estimated will earn the equivalent of $1 million per year in additional foreign exchange for Austria. Among foreign markets in which Leykam products are sold are Arabia, Israel, Indonesia, Pakistan, the Philippines, Australia, and Western European countries.

The Nettingsdorf project provides for construction of a new and completely integrated kraft pulp and paper mill to be operated by Nettingsdorfer Papierfabrik Aktiengesellschaft in conjunction with facilities in an existing mill. To a large extent production will be converted from the manufacture of sulphite and groundwood pulp and paper to production of kraft pulp and paper.

The mill's present output of sulphite and groundwood pulp is 11,000 metric tons per year, and of sulphite wrapping paper and sulphite groundwood paper, about 18,000 metric tons per year, including newsprint. As a result of the project, about 30,000 metric tons of unbleached kraft pulp will be produced yearly, of which about 24,000 tons will be converted into basic grades of kraft paper with the new equipment and the remainder will be processed on one of the old existing machines.

Austria's packaging needs are now being met in part by imports. With the Nettingsdorf mill's anticipated kraft paper output, the country is expected to improve her foreign exchange position by the equivalent of about $2.5 million per year both through cutting of imports and exporting of the new kraft paper products.

ECA dollar financing in the Nettingsdorf project will amount to $2,280,000, which is a little less than one-third of the cost of the entire project, estimated at the equivalent of $7,072,000. The ECA dollars will finance the cost of equipment to be purchased in the United States, including a large, modern, high speed Fourdrinier paper machine.

EQUIPMENT FOR AUSTRIAN MILLS

Commodities:

(A)—One Paper Machine of 3,700 mm trim width

(B)—High Speed Fourdrinier Machine 198" width
Material Handling Equipment
Wood Chipping Machine
Continuous Washing Machine
2 Dish Refiners
Soda Recovery Unit
Electro-filter
Causticizing Equipment
Laboratory Testing Equipment — $136,537
Consulting Engineering — $45,000
Stock Preparation Equipment for Paper Machines III and IV
Rewinding Machine

Interested American Suppliers Should:

For item under (A) above, get in touch with Leykam-Josefsthal, A.G., Wien 1, Parkring 2, Austria.

Items under (B) above, get in touch with Nettingsdorfer Papierfabrik, Aktiengesellschaft, Nettingsdorf, Upper Austria.

More on Halifax Expansion

Halifax Paper Co., Inc., Roanoke Rapids, N. C., and The Albemarle Paper Manufacturing Co., Richmond, Va., affiliated companies, announced December 30 that they had consumated a loan with the Reconstruction Finance Corp. for $5,800,000 and had completed negotiations for the issuance and sale of $1 million of preferred stock. The money provided by the above loan and stock sale will be used to reorganize the financial program of the companies and provide necessary cash for plant expansion at Halifax Paper Co., Roanoke Rapids, N. C., according to a release by F. D. Gottwald, president of both Halifax and Albemarle.

At the same time, it was announced that Halifax Paper Co. had signed a $5,800,000 guaranteed maximum type of contract with The Rust Engineering Co., Pittsburgh, Pa., covering plant expansion at Roanoke Rapids. The contract included: an additional coal or oil-fired boiler of a rated capacity of 45,000 pounds of steam per hour; a high density pulp storage tower; a new paper machine and paper mill. The paper machine, to be made by Beloit Iron Works, Beloit, Wis., is the fourdrinier type and will embody a pressure type head box, a forming wire 246 inches wide by 130 feet long, latest type press section, 33 paper dryers, 2 felt dryers, each 60 inches in diameter and built to withstand 125 pounds of steam pressure, a breaker stack, a six-roll calendar stack, Beloit mechanical sectional drive, mechanical reel pull, Ross-Grewin ventilating system, automatic enclosed oiling system and anti-friction bearings throughout. The machine will be capable of operating at speed up to 2000 feet per minute.

The machine will be housed in a concrete, steel and brick building 600 feet long by 76 feet wide. The building will run in an approximate north-south direction starting at the west end of the pulp mill and running south through the present wood yard. In addition to the paper machine, the building will house the associated stock preparation equipment and necessary finishing and shipping facilities. Operation of the mill throughout is as nearly guided and controlled by instruments as the latest developments and good judgment will permit. Work on the project is expected to start in the Spring of 1951 and, barring unforeseen developments, should be completed by December of 1952. It is interesting to note that the new paper mill building is being constructed in such a manner that a second large paper machine could be installed later at a minimum cost and without disturbing the then existing operation.

Northern's Stream Improvement Plan

GREEN BAY, WIS.—Northern Paper Mills has announced that it will construct at an estimated cost of $1,500,000, a plant to reduce sulphite pollution of the Fox river. First moves to get under way will be taken by the company just as soon as state authorities approve its plans, the statement declared.

The company pointed out in its release that the new plant is the culmination of many years of research to find a workable solution to the problem of disposing of spent sulphite liquor. Pulp manufacturers have long maintained that sulphite liquor presents the most difficult task in reducing pollution from industry wastes.

At a public hearing on December 22, 1949, Northern testified that it had researched, in cooperation with other Wisconsin mills, for years on this problem without getting a final answer. However, according to its testimony at that time, a ray of hope had developed in the research, so that a method practical to install and operate might develop reasonably soon.

"This plant has been developed from that start," declared Milan Boex, president of Northern Paper Mills, in his statement. "The company today submitted to the Committee on Water Pollution and the State Board of Health detailed plans and specifications for a plant using the evaporation and burning process for disposing of spent sulphite liquor. These plans are for a full-scale plant to reduce sulphite pollution."

"No sulphite mill in North America using the calcium base method of pulping which is standard in this state, has yet successfully operated a commercial unit for evaporating and burning, with all of its ramifications," Boex further declared.

In his company's report to the state bodies he stated, "The time allotted to Northern by the Committee's order did not permit full exploration of all of the conditions that may be encountered in commercial operations. Indications are that an installation should enable Northern to reduce the pollutional effects from spent sulphite liquor by 40 percent to 45 percent."

"The process of evaporating much of the water from spent sulphite liquor to concentrate its content of dissolved wood solids and then burning it as industrial fuel was selected as best adapted to Northern's situation after investigation of three other promising processes," Mr. Boex told the Committee. By submitting its plans at this time, Northern achieved compliance days ahead of the official deadline.

In orders issued on February 21, 1950, state authorities requested Northern and Hoberg Paper Mills, both of Green Bay, as well as Consolidated Water Power and Paper Co.'s Interlake mill at Appleton, to submit by December 31, 1950, detailed plans and specifications to reduce their pollution of the Fox river to an acceptable minimum. The state's order further stipulated that upon official acceptance and approval of these plans, construction is to be completed by December 31, 1951.

The estimated $1,500,000 cost to complete the proposed installation covered by Northern Paper Mills' plans at today's cost levels does not include a building. The company already has a building which with some modifications can be made adequate to house the proposed equipment for collecting and evaporating the spent liquor.

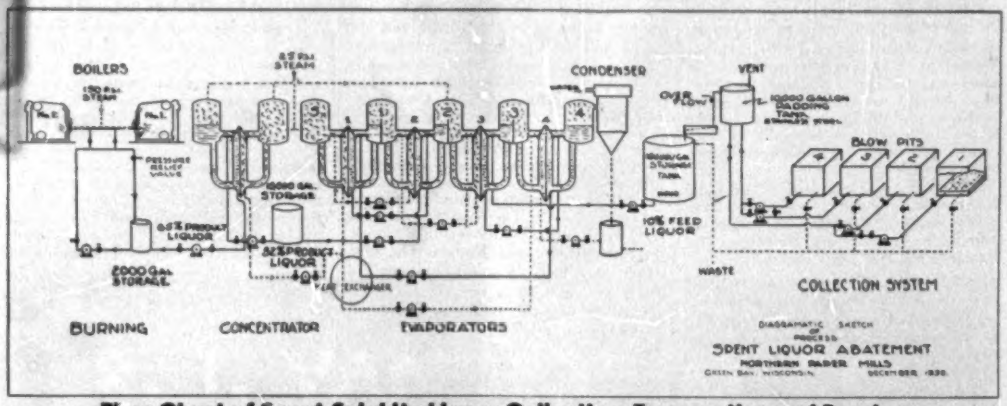
In the formal report, which is signed by Mr. Boex, Northern agreed to start to negotiate and place orders for required equipment promptly after its plans are officially approved.

Pointing out to the state authorities that stainless steel is essential in handling spent sulphite liquor, the report likewise called to their attention that emergency defense demands have already made stainless steel extremely difficult to obtain for civilian use, with every indication that this scarcity will become even more acute. "If Northern eventually should find itself unable to obtain necessary materials, the company will ask the Committee to take up with federal materials control authorities the public importance of pollution reduction and assist in obtaining the requisite priorities so that any plans which the Committee accepts can be carried through with the required materials," Mr. Boex notified the state bodies concerned.

Northern emphasized that it sincerely wishes to carry through its plans to completion. But to guard against any possibility of finding itself forced by some United States federal defense regulation to violate some part of a Wisconsin state order, Northern formally requested the Committee on Water Pollution and the State Board of Health to modify their order of February 21, 1950, so that the time limit for completing construction will be automatically extended if for defense or other reasons beyond the company's control it should find itself unable to obtain equipment required for its proposed treatment plant.

Accompanying Mr. Boex's report, Northern supplied to the state authorities a set of large scale engineering drawings of the proposed installation, a flow chart showing how the spent sulphite liquor will be handled, a description of the process and full specifications. Besides the treatment plant proper, these documents disclose, the company is changing some of its

(Continued on page 20)



Flow Chart of Spent Sulphite Liquor Collection, Evaporation and Burning

Spent sulphite liquor of 10% concentration is collected from the floor of the four blow pits, shown on the right, pumped to the padding tank, and screened into the storage tank. It is then pumped through the four multiple effect evaporators resulting in 52% liquor through the concentrator resulting in 65% liquor atomized with high pressure steam and burned under the boiler.

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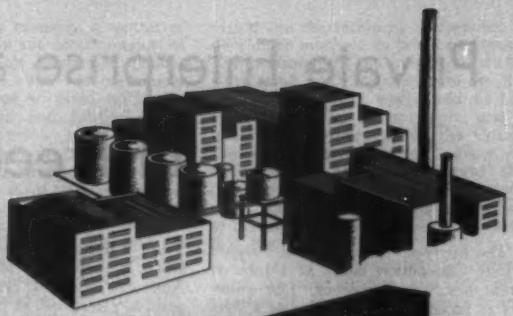

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Private Enterprise and the Defense of Freedom*

The thirty-seventh National Foreign Trade Convention meets at a time of great national emergency. Our country is faced with the reality of a life-and-death struggle against forces of military aggression and communist subversion, inspired by the Kremlin and dominated by a resurgent Russian imperialism — a struggle which pits our physical energies, our free economic system, our political concepts, and our spiritual ideals against a ruthless, dictatorial regime and a way of life diametrically opposed to all we stand for.

Now, more than ever, it is abundantly clear that we must be productive if we are to be strong, and that we must be strong if we are to survive. We must build up our strength in the realm of ideas as well as in the field of physical production: for within and beyond the fact of military aggression is the ceaseless effort of our foe to possess the minds and souls of men.

We have before us, then, a dual challenge. We must meet the monstrous lie of communism with the great truth of freedom; and we must back our words with the economic might of a free people.

Our great task, in the ideological struggle, is to help the world to understand what is at stake—to unmask the false prophets of the collectivist Utopia and expose the cruel visage of tyranny and oppression. This we can do, for truth is stronger than falsehood; and justice, peace and freedom are eternal aspirations in the minds and hearts of men.

Our great task, in the battle of production, is to reinforce the strength of the world's free peoples so that military aggression can be resisted and subversion overcome. The key to this task is production, more production, and still more production — production for the defense of the nation; production to sustain our friends and strengthen their will to resist aggression; production to frustrate our enemies and weaken the appeal of their specious doctrines. The policies we pursue, both foreign and domestic—in the economic field, as in all others—must be dedicated to this increase in production, not only in the United States, but also in the free lands abroad.

The final declarations of the thirty-fifth and thirty-sixth National Foreign Trade Conventions were, in their essence, expressions of faith in the American system of free, private, competitive enterprise, as the most efficient and productive the world has known. The thirty-seventh convention affirms its own faith in this system, and calls upon the American people, in this time of crisis, to dedicate themselves anew to its preservation. The private enterprise system, even with such limitations and controls as military necessity may require, still remains our chief reliance in the struggle which confronts us.

The incentives inherent in this system have called forth, through the years, the initiative, the ingenuity and the skills that have built and energized our great industrial machine, and have enabled us to achieve unparalleled standards of productivity. Whatever new burdens the crisis puts upon us, the incentives in our economic system must be preserved, for they are the well-springs from which it draws its vitality and its continued strength.

Our nation, once again, must be the great arsenal of freedom, and we must marshal our resources for this task. Once again, the functions of government will be expanded and economic controls will restrict the freedom of the market place. These controls must be regarded as temporary expedients, justified only by the contribution they may make to the national security and, thus, to the preservation of an environment within which freedom can be fully restored. The convention warns that such controls must be applied with caution, lest they weaken the private enterprise system beyond repair. We must not, in our fight against tyranny, lose the very weapon which is helping us most; we must not sacrifice the very freedom we are fighting to preserve.

The fight for freedom is not ours alone. Both in the area of military production, and in the area of the civilian production needed to sustain it, the other free nations must do their part, whatever sacrifices may be entailed, and whatever the demands may be upon their resources and their ingenuity—for no sacrifice could be so great as the loss of freedom that would follow failure.

The burden of waging the battle of production is one which all free nations must share. Great as our resources may be, they are not inexhaustible; and dynamic as our economic system is, it cannot, by itself, achieve the levels of production necessary to meet the challenge the free world faces. We must do what we can, within the limits imposed by our own needs, to help our partner nations in the efforts they make to build up their productivity. But the major task in this direction is theirs; and we must not, in anything we do, encourage them to shirk it.

American foreign traders and investors have a vital part in this great productive effort of the world's free peoples. The sources of supply for most of the raw materials essential to production have been sought out and developed by private investors who have had the initiative and the courage to venture their capital in foreign lands. Foreign traders have transported these materials across the seas and made them available to centers of manufacture; and they have provided the mechanism for the inter-change of the finished products — the tools, the machines and the military weapons — that are needed by the free world in its struggle for survival.

The opportunities which have enabled private enterprise, through the years, to make its great contribution to the world's progress must be preserved in the crisis that confronts us. The foreign traders and investors represented at this thirty-seventh National Foreign Trade Convention, with full appreciation of their own responsibilities in the united effort to achieve greater production, call for concerted action by the governments of the United States and all friendly countries to remove the obstacles which restrict the international movement of private investment capital and impede the flow of commerce. These obstacles must be removed before there can be a return to a system of multilateral trade under which the free world can realize its full productive potential.

The progressive elimination of existing barriers to international trade and investment, and the fostering of greater productivity throughout the free world, have been collateral objectives of the foreign economic policy of the United States during the entire post-war period; and the ECA program for European cooperation has been an important instrumentality for their accomplishment. Under the stimulus of the American aid made available through this program, the countries of Western Europe have made good progress toward a cooperative solution of their economic problems. Impressive gains have been achieved in the production of capital goods; the output

* Final declaration of the Thirty-Seventh National Foreign Trade Council Convention, November 1, 1950 at New York City.

of consumer goods has increased; inter-European trade has revived; currencies have become stronger; and there has been a substantial improvement in the living standards of the people which has helped to halt the spread of the communist ideology.

The expansion in industrial production, and the increased efficiency achieved under the ECA program, have enabled the European countries to build up their exports to the dollar area; and the rearmament program of the United States has only intensified a trend which already was in evidence before the communist onslaught in Korea. The rapid closing of the dollar gap, at a time when the American people are faced with a tremendous increase in military expenditures, has justified the expectation that a substantial saving can be effected in ECA appropriations during the remaining two years of the program.

The impressive gains already achieved under ECA are most gratifying to the American people, whose free enterprise system produced the goods and provided the funds that made possible this great experiment in international cooperation. But it is well to bear in mind that these gains have been won at great cost; and that the long-term objective of European integration, as an essential component of an expanding world economy, is still far from accomplishment. Furthermore, our satisfaction at the narrowing of the dollar gap should be tempered by the realization that it has been accomplished by the maintenance or extention of barriers against the importation of American goods as well as by the expansion of European productivity and exports.

So long as the free world is confronted by the menace of communist aggression, the main emphasis of our European policy must be on the necessity for rearmament, and it is inevitable that there will be a substantial conversion of productivity to serve this purpose; but the economic gains already achieved in this great cooperative endeavor under ECA must not, and need not, be lost. The present emergency must not be made the occasion for a return by Western Europe to the ruinous restrictions of economic nationalism, for a resurgence of the deadening cartelist philosophy, or for the promotion of equally deadening programs for socialization of industry — all of which are insidious enemies of economic progress. Now, more than ever, it is imperative that the restrictive devices of economic nationalism give way to a more effective cooperation among nations; and that economic inertia, whether induced by socialism or monopoly-capitalism, be replaced by the drive of a dynamic competitive economy. In no other way will it be possible to achieve the levels of production required to meet both military requirements and civilian needs during the critical period of rearmament.

The economic rehabilitation of Western Europe with its great productive capacity is, very properly, a matter of major concern in the determination of American foreign economic policy; but we must not allow our preoccupation with Europe to blind us to the serious economic and political problems of the world's less-developed areas. It is in these areas that we have suffered a major reverse in the realm of ideas, and it is in these areas that we can suffer a major loss in the battle of production. Here are the sources of many of the raw materials that are most vital to our defense effort, and it is of utmost importance that these resources be developed and safeguarded from infringement by unfriendly powers. Here the poverty and despair of millions of human beings are being exploited by the cynical purveyors of the communist doctrine, and we must show these people the road to a better way of life. This is the field of the Point IV program and, in the present crisis, it takes on a new urgency. A practical program, soundly administered, could become a valuable instrument of foreign policy in helping the peoples of the world's economically-retarded areas to achieve higher levels of productivity and improved standards of living.

The Point IV program, as originally enunciated by President Truman, and as subsequently interpreted by other responsible officials of our Government, placed its greatest emphasis on the exchange of technical knowledge and skills and the encouragement of private enterprise development of the world's backward areas. For these two main objectives to be compatible, it is essential that the technical assistance furnished by governments and government agencies be of a type that will supplement and not compete with private enterprise. Existing agencies of our Government, and of the United Nations, have shown much competence in dealing with such fundamental problems as health, nutrition, sanitation, education, and improvement of agricultural methods; but in the field of industrial development and its related techniques, there is no substitute for the knowledge and experience of private enterprise.

The Point IV legislation recently enacted by the United States Congress includes an important statement of policy which underlines the need for encouraging the international flow of investment capital, and correctly points out that capital will flow "only where there is understanding of the mutual advantages" of foreign investment and "where there is confidence of fair and reasonable treatment . . . imparted through intergovernmental agreements or otherwise."

American private enterprise has never been reluctant to venture abroad where opportunities for profit existed and where there was reason for confidence that it would be treated fairly; and the free world owes much of its capacity to resist aggression to the pioneering work of American investors, businessmen and engineers, who have had the vision and the technical competence to develop so much of its latent resources. The continuation and extension of this work is of vital importance to the defense of the free world and to the future well-being of its people; and it is entirely appropriate that the United States Government should devote its major Point IV effort toward the creation of an international environment conducive to an expanded flow of private investment capital to nations that have need of it.

The convention regards the negotiation of tax treaties and the new treaties of friendship, commerce and economic development as a very important element of the Point IV program. While the convention urges that these negotiations be pressed with all possible vigor, it recognizes that a treaty can be no better than the will of the participants to respect their contractual obligations. These treaties will have no practical value to the signatory countries or to American private investors, unless the signatories are convinced that the treaty provisions are in their national interest. It is obvious, therefore, that if the treaty phase of the Point IV program is to succeed, our negotiators must, without exception, be men who understand and thoroughly believe in the private enterprise philosophy. It is equally clear that our foreign investors and our government must do a more effective job than has been done heretofore in telling the inspiring story of progress and achievement that has been written by American private enterprise wherever it has been given a fair opportunity to do its constructive work.

The great majority of American investors are opposed, as a matter of principle, to the use of public funds to guarantee their foreign investments against exchange inconvertibility, confiscation or other hazards. They do not ask for subsidies, and they seek no special favors. All they ask from the Government is the assurance of sympathetic understanding and cooperation in the solution of their problems, and the right to be heard before decisions are made on matters of policy that vitally affect their foreign investments.

Economic progress cannot be imposed or ordered by government; nor can it be purchased with gifts or subsidies. It can be achieved only through the enterprise, the thrift and the hard work of many people in all walks of life whose individual contribution is motivated by the hope of profit and the satisfaction of accomplishment. The role of government, in Point IV as in all economic activity, should be that of furnishing protection, encouragement and such assistance as is appropriate and within its competence to all those who participate in productive work, while preserving the incentives that make for progress.

The effectiveness of ECA, Point IV, or any other instrument of foreign economic policy, and the strength of our

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foreign policy in its political and military aspects as well, must inevitably be predicated upon the maintenance of a domestic economy that is vigorous and fundamentally sound. Our economy today is under severe strain and is threatened by mounting inflationary pressures. Following a long period of deficit financing, we enter this critical period of transition to a war economy with a huge national debt, heavy commitments for social welfare at home and economic assistance abroad, an unbalanced national budget, a highly inflated price structure, and an expanding supply of money and credit. Superimposed upon this inflationary structure is the certainty of greatly increased government spending for national defense and the diversion of plant capacity to the production of military equipment, with the probability of a diminishing supply of consumer goods at a time when the means of payment are expanding.

The Convention is deeply concerned over the growing menace of inflation in the United States and throughout the free world — not only because it creates uncertainties for American foreign traders and investors but, more importantly, because it poses a serious threat to the stability of our own economy and to the ability of the world's free peoples to outproduce the forces arrayed against them. Inflation is the enemy within our gates. Its insidious advance is as real a menace to our way of life as the more overt acts of a foreign aggressor; and American foreign traders and investors can perform no greater service than to arouse the nation to its dangers.

The Convention warns that government controls, alone, will never stifle the fires of inflation. It calls for a concerted attack against the contributing causes, rather than the use of repressive measures to conceal their effects. It believes that waste and extravagance on the part of governments and individuals are prime contributing factors to the present inflationary situation. It recognizes that a war economy is a wasteful economy and a costly one, but it maintains that inflationary pressures can be greatly relieved by curtailment of non-essential spending and by the adoption of sound fiscal measures. It calls, therefore, for the exercise of voluntary restraints by officials of government, by business management and by private citizens; the elimination of waste and extravagance, wherever they appear; and, in our own nation, a major effort to avoid a further increase in the national debt. It recognizes that the last-named objective cannot be accomplished without an increase in the tax burden which already is the highest in our history. It also recognizes that the measures advocated may entail a reduction in our domestic standard of living; but if this should occur, it would be a small price to pay to avert serious impairment or destruction of our economic system.

The defense of the free world and the hopes of all who cherish freedom are centered in the unparalleled productivity of our private enterprise economy. American foreign traders and investors are prepared, in this emergency, as in others in our history, to accept such temporary limitations on our economic freedom as are clearly in the public interest; but we will resist, strongly and unremittingly, any tendency by government toward needless assumption of the prerogatives of private enterprise and any attempt to perpetuate its intervention in economic affairs. For our economic freedom is a precious thing and is not lightly put aside. Whatever the future may bring, we must preserve, in our free America, the right of the individual citizen to seek self-expression and personal satisfaction in work of his own choosing; to achieve whatever goals are within the limit of his ability; and to live in freedom and self-respect among his fellows. These rights are the fundamentals of human liberty and the foundation of our economic system. The Kremlin could gain no greater victory than by their destruction.

Viscosity

NEIL MAC COULL[1]

(Continued from December 28, 1950, issue)

PART III—Turbulence

The preceding discussion on the flow of viscous fluids was limited to streamline flow, in which the fluid flows as in a series of parallel or concentric surfaces having relative velocity, but no intermingling or mixing between one and another. This discussion will now be expanded to include turbulent flow which follows when fluid velocity is sufficiently increased. The classic demonstration of this phenomenon was given in 1883 by Osborn Reynolds when he admitted a fine thread of colored liquid into the center of a stream of water flowing into a glass tube with a submerged bell mouth. When water flowed at low velocity, streamline flow was indicated by a steady thread of color which remained surrounded by the stream for the whole length of the tube, as illustrated in *Figure* 18. As the velocity was continuously increased, turbulent flow started suddenly at a point about 30 or more diameters of the tube from the entrance, as indicated by the colored thread expanding into a band of color which filled the remainder of the tube. When viewed in a darkened room by a flashing or stroboscopic light, it was seen that the colored band consisted of distinct undulatory eddies as indicated in *Figure 18A*.

This region of turbulent flow is of great practical interest because the resistance to flow increases here more rapidly with velocity than in the streamline region,* and transfer of heat between the liquid and the metal is much more rapid. Furthermore, the flow of most fluids in pipes is in this region, in contrast to the flow in capillary tubes discussed previously, which is normally in the streamline region. The velocity which divides these two types of flow is called the *Critical Velocity*, and even under a definite set of conditions, it covers a considerable range of unstable flow and depends on whether the flow rate is increasing or

Figure 18—Streamline flow through a tube as by a "thread" of dyed liquid entering the bellmouthed end (at the left) with the fluid.

Figure 18A—The beginning of turbulent flow as indicated by the dyed thread of liquid as it breaks into eddies.

Figs. 18 and 18A Courtesy of the McGraw-Hill Book Co., Inc., from "Fluidity and Plasticity," by Dr. Eugene C. Bingham (Lane & Dean's Data)

[*] Published with permission of the Texas Co.

[1] Technical and Research Div., The Texas Co., Beacon, N. Y.

[*] In streamline flow: Resistance increases directly with velocity. In turbulent flow: Resistance increases with (velocity)$^{1.7}$.

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decreasing, the roughness of the surface, etc. In general, however, this velocity increases with the viscosity and density of the fluid, and decreases with the diameter of the tube or pipe. The length has no effect on the critical velocity. This velocity may be determined from a ratio called the Reynolds Number. Expressed as a formula in any consistent system of dimensions:

$$(\text{Reynolds No.}) = \frac{(\text{velocity}) \times (\text{tube diam.})}{(\text{kinematic viscosity})} \quad (16)$$

The Reynolds Number at the critical velocity varies from about 2000 up to even 50,000 under exceptional conditions, but in general a value of 2320 is used, as the minimum value above which streamline flow becomes "metastable" and requires progressively smaller disturbances to cause its transformation into the turbulent region.

A more convenient equivalent form of equation 16 for commercial applications to flow in pipes in our usual system of measures is:

$$R = \frac{(\text{U. S. gallons per minute}) \times 100}{(\text{diam. in inches}) \times (\text{viscosity in cs})} \quad (17)$$

The pressure required to overcome the fluid friction per 1000 feet of pipe may be determined from:

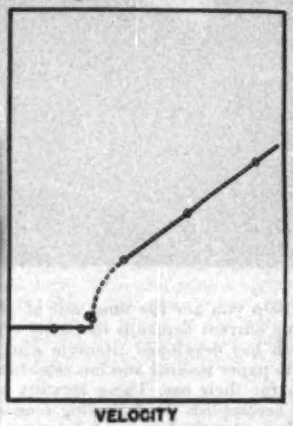
$$(\text{Pounds/sq. in.}) = \frac{C\ (\text{gpm})^2 \times (\text{sp. gr.})}{(\text{diameter in inches})^5} \quad (18)$$

where C is taken from the chart of *Figure 20* when the value R has been obtained from equation 17. The part of the chart to the left of a critical velocity factor R = 57 represents the streamline flow where the pressure increases directly with the velocity or flow rate.*

It is obvious that in small tube or capillary viscometers in which streamline flow is assumed, precautions should be taken to assure flow below the critical velocity. If this is not done, the indications of viscosity will be too high. An example of this is indicated for a torsion viscometer in *Figure 19*. Here the measure of friction drag has been divided by the velocity (or rpm). As long as the fluid flow is streamline, the indicated viscosity remains constant, as shown by the horizontal section of the line to the left. At the velocity of turbulent flow, the curve suddenly rises, and after passing through the uncertain transitionary zone indicated by the dotted line, settles down to a straight line with a constant slope.

$$* \text{ Psi/1000 ft.} = \frac{0.273\ (\text{viscosity in cp}) \times (\text{gpm})}{(\text{diameter in inches})^4}$$

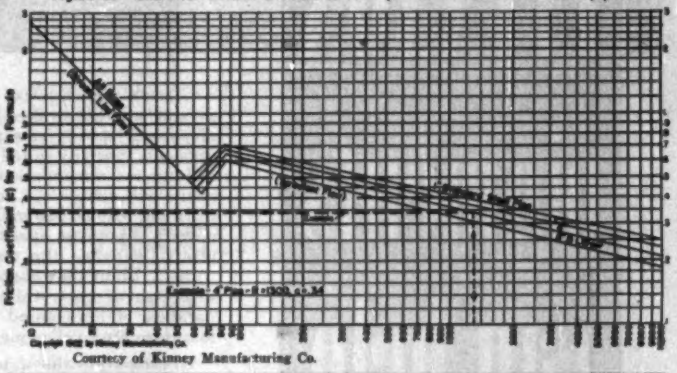
(To be continued next week)



Courtesy of the McGraw-Hill Book Co., Inc., from "Fluidity and Plasticity," by Dr. Eugene C. Bingham.

Figure 19—The transition from streamline to turbulent flow as revealed by Torsion Type Viscometers. The horizontal line (at the left) indicates streamline flow; the dotted curved section, the unstable transition zone; and the straight inclined line indicates the stable region of turbulent flow.

Figure 20—Chart for friction coefficients for liquid flow in commercial steel pipes.



Courtesy of Kinney Manufacturing Co.

GREAT NORTHERN'S PLAN

(Continued from page 12)

pulping practices in order to make the treatment process feasible.

Instead of placing water in a blow pit as a pad before blowing in the contents of a digester, as at present, the mill will pad the blow pit with liquor from a previous cook. This change will decrease the dilution of the incoming spent liquor which eventually must be boiled down to greater concentration. It is expected that liquor collected for processing will average about 10 percent solids in solution. Instead of discharging spent liquor to the sewer from the blow pits, each blow pit will be equipped to pump the liquor to a 10,000 gal. stainless steel padding tank, through screens, and then to a 100,000 gal. wooden storage tank. This capacity is sufficient to store liquor from five digester blows, or about 12 hours' collection.

The collected 10 percent spent liquor will pass from storage to a five vapor body quadruple effect evaporator of the reversing type designed to prevent excessive lime scaling. Here the liquor will be evaporated to 52 percent concentration. The 52 percent material will in turn pass through a two vapor body concentrator of reversing type for further reduction to a solids content between 60 percent and 65 percent so that it can be burned in the power plant boiler through atomizing burners. The concentration operation involves handling 101,000 lb. of 10 percent liquor hourly through evaporation to end up with 19,400 lb. of heavy concentrated liquor. The concentrate will be stored at 200°F. in a supply tank adjacent to the boiler plant.

Fly ash from burning the spent liquor is high in calcium content. It is about 50 percent finer than fly ash which results from burning coal, and presents an accordingly more difficult problem to collect and dispose of. Plans for fly ash collectors on the mill's two existing boilers will be submitted to the City of Green Bay for approval under its air pollution ordinance. Because the fly ash is so fine, special handling will be required for hauling it from the plant after it is collected.

Collection and evaporation equipment will be housed in a 40 x 140 foot three-story brick building of fire resistant construction. This structure is already built, but requires one major modification. The proposed evaporator equipment would be too high for the present roof level, and so the roof must be raised 14 feet to accommodate these units. The operating floor of the evaporation equipment will be about 25 feet above the ground floor.

Northern believes that when the proposed plant goes into operation it will do Northern's share toward raising the oxygen content of the water in the Fox river.

STARCH FOR UNITED KINGDOM

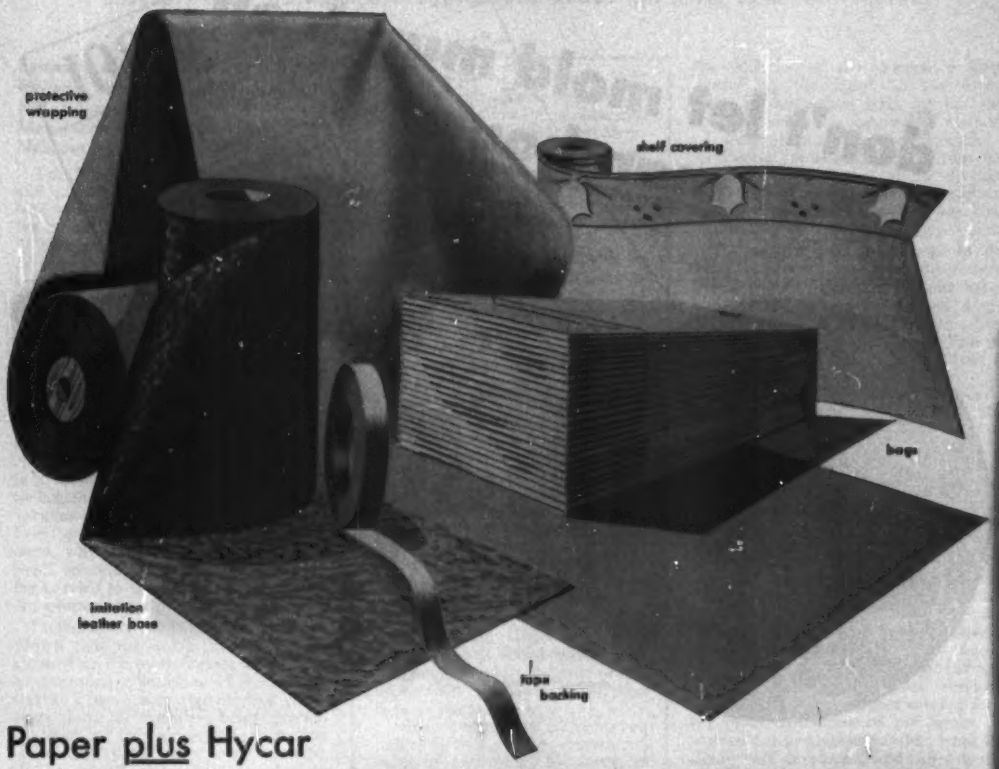
WASHINGTON, D. C.—Starch totaling $1,344,000 was authorized for procurement from sources in this country for export to the United Kingdom, in ECA procurement operations last week.

Substantial quantities of naval stores also were authorized for the same country, including gum rosin, $100,000; tall oil, pine oil, pine tar, pinene, dipentine, and balsam, $300,000.

News about

B. F. Goodrich Chemical Company

raw materials



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Paper becomes softer and stronger when impregnated with Hycar, makes smooth-draping sheets. It has better resistance to absorption, improved tear and wet strength, cloth-like feel.

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Hycar-based adhesives can permanently bond paper, wood, leather, aluminum foil and vinyl films to themselves as well as to other materials.

Send for helpful technical bulletins. Please address Dept. HJ- 1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

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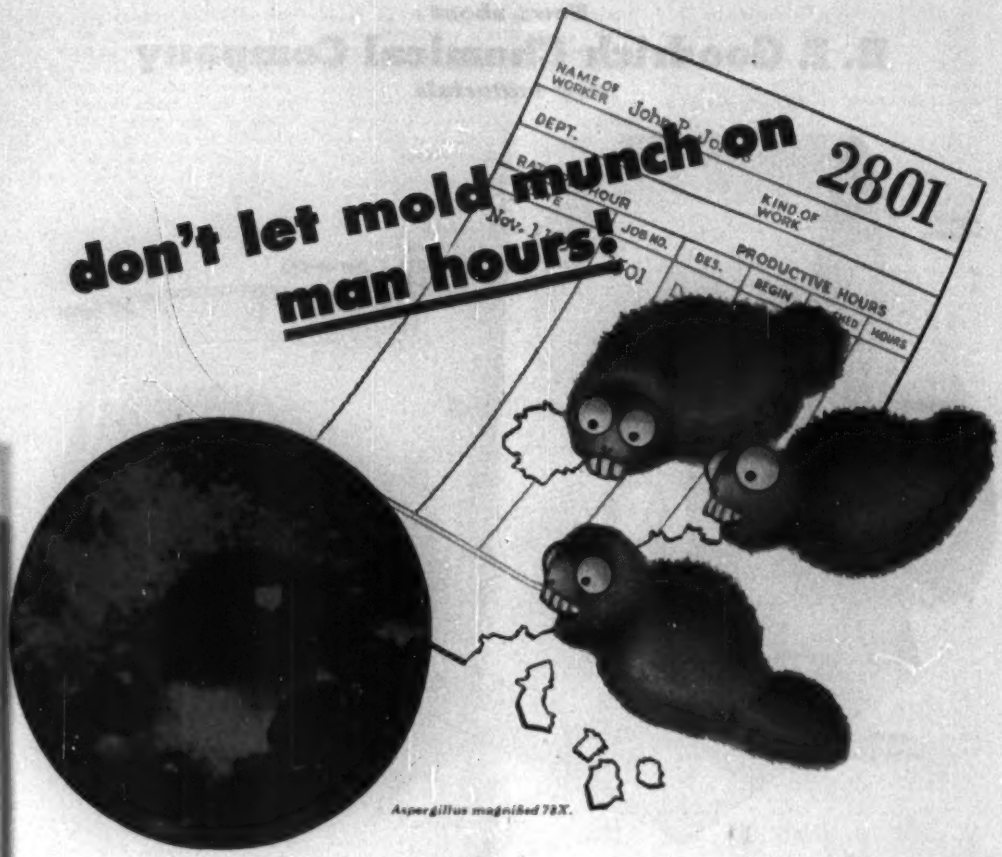

Aspergillus magnified 78X.

Mold and bacteria can cause significant loss of man hours and material in the pulp and paper industry.

Dowicides work effectively and economically to protect starches, casein, glue and other decomposable adhesives, sizes or coating materials from attack by mold and bacteria. They also prevent mildew on lap stock in storage and the deterioration of paper board cartons and other paper products which may be stored or used under humid conditions.

Water and wax-soluble Dowicides will give full protection to various types of soap wrappers.

If you are not already using Dowicides for all-around microbial protection in *your* mill, contact your nearest Dow sales office today, or write to Midland. Dow maintains complete laboratory facilities to help solve your problems.

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Fish or Factories?

Excerpts from statements made before Wisconsin River Pollution Hearing

Summary of Mill Statement, Nekoosa-Edwards Paper Co., Nekoosa Kraft Mill, Nekoosa, Wis., by R. A. Nugent, Manufacturing Superintendent of the Nekoosa mill.

The Nekoosa Mill has in the past and expects in the future to install the best equipment available to the industry to obtain efficient operation which in turn means lowest possible loss of process chemicals and fiber to the mill sewers. A total of $569,300 has been spent in the past ten years on equipment which directly effects decreased loss of fiber or chemicals to the sewer. We are now contemplating spending $76,000 in 1951 to eliminate fiber loss from the wood room, for sanitary sewerage and to improve evaporator operation. We expect to put into operation in 1951 a $200,000 continuous Dorr Alkali system. This equipment is now in process of installation. It is planned to use the condensate water from the vacuum evaporator continuously in this Dorr causticizing and settling equipment, which will largely eliminate the small concentration of mercaptans being carried to the river from the vacuum evaporator.

In the above statements it has been shown that the kraft process can be adapted to the manufacture of pulp so as to minimize pollution of the process water. I have not attempted to cover every detail of the work being carried out, such as daily sewer reports by the laboratory staff, who have periodic checks on all shifts and make daily reports to the operating departments.

Summary of the General Technical Statement for the Kraft Mills on the Wisconsin River by Willis M. Van Horn, Research Associate and Head of the Biological Division at the Institute of Paper Chemistry, Appleton, Wis.

For many years our attention has been directed to a study of the effect of waste waters from kraft mills on the receiving water, with particular reference to the quality of that water as far as fish and other stream forms are concerned.

A general discussion of the problems facing a kraft mill with relation to stream improvement was given. It was pointed out that, because a kraft mill recovers and burns its spent liquor, the oxygen depleting capacity of its wastes is low. It was also demonstrated that there is not a toxicity problem associated with the operations of kraft mills on the Wisconsin River. The evidence over the years indicates that these mills have been diligent in reducing fiber loss to a minimum.

> The work of Wisconsin Pulp & Paper Manufacturers to improve stream quality is outstanding. Many of their problems have been solved, some show improvement, and others have defied solution to date. There is ample evidence of continued research based on the mills ability to pay the cost.
>
> It must always be borne in mind that mills always face a double taxation on problems of stream improvement, their own cost and that of municipal improvement. Most mills are heavy taxpayers in their home towns.
>
> It should also be borne in mind that these mills are important to the general economy as employers, taxpayers and buyers. According to the latest census (1947) Pulp and Paper is the seventh largest industry in Wisconsin, with a payroll of $54,000,000. It exceeds the Dairy Products Industry producer of famed Wisconsin cheese in "value added by manufacture" by $32,000,000. Certainly everything possible is done to promote this dairy product.
>
> Is there any sound reason why this state should not be as proud of its pulp and paper industry as it is of cheese?
>
> Unfortunately, we have no reliable figures on the economic value of recreation. No doubt, it is huge.
>
> We must, however, earn first our living in the mills and factories before we can fish or vacation.

Excerpts from a statement by Allen Abrams, vice-president, Marathon Corp.

I will tell you briefly of the instance which I know most intimately and at first hand. This is the experience of my company in reducing the pollution caused by one industrial waste.

For 23 years I have followed this project closely, with the hope of bringing about exactly the results that your committee desires. Telling about it is the best way I know to give your committee and all others here present a graphic picture and a thorough understanding of the technical and economic problems involved in a conscientious effort to reduce pollution.

Marathon Corporation realized many years ago the importance of reducing the pollution of the Wisconsin River caused by the spent sulphite liquor from its Rothschild mill. In 1927 active research was begun on methods of accomplishing this so that today a substantial reduction in pollution has resulted. The solution of the problem has not been easy, and the expenditure of large amounts of money has been required.

The original intention was to develop a process which would remove the inorganic materials in one stage and the lignin in the second stage. Then each mill could utilize these products in its own operation. The inorganic material would be employed in making cooking liquor.

It was thought that the recovered lignin could be burned as fuel. But after extensive effort and expense we found it necessary to give this up as impractical. Other mills came to study our process in expectation that they could use it as a way to burn lignin, but they too came to the same conclusion as Marathon.

This failure required a complete change in the approach to the problem, but there was no slackening of effort to solve it. The process was inherently costly, and could be supported only if part of the expense could be met by making it yield some revenue. Laboratory research and market research were accordingly directed toward finding other utilization of the lignin. A method for producing vanillin from the lignin was developed, and other methods for using the material as a tan for leather and as an additive for cement.

In 1937 a plant was constructed to carry out this process of lignin recovery. A number of sales contracts were entered into in order to dispose of as much of the lignin as possible.

Continued research resulted in the manufacture of other products such as boiler water compounds and dispersing agents for a variety of applications. Extensive effort on market development and sales has gradually built up outlets for the lignin products. It has been necessary to maintain these efforts in order to replace disappearing markets, meet competition and fit the changing requirements of customers. For example, consider boiler water compound. The railroads have from the outset been one of our major customers, but the growing use of the Diesel locomotive forecasts that this market will eventually pass out. Also, tanneries in search of outlets to aid them in fighting pollution from their spent tanning liquor have invaded the boiler water field with a product which they dump at low prices.

Ever since we began solving techni-

cal problems in using our basic process, we have been faced with a succession of marketing problems to keep the products moving into consumption. Most of these products have such limited sales volume that they would not attract other mills to make the same things that we are already making. In consequence, our basic process has not been adopted by any other company.

As a means of reducing Marathon's pollution, this process has proved successful. The operation of the chemical division reduces the pollution effect of the treated spent sulphite liquor by 60 percent. Since 75 percent of the liquor can be collected at a sufficiently high concentration for processing, this means that the treatment can reduce the overall pollution effect by about 45 percent. The last available state survey of the mill showed a reduction of 44 percent.

Up to the present, $1,800,000 has been spent by Marathon for research on treatment of spent sulphite liquor. In addition to this, $67,000 has been contributed to the Sulphite Pulp Manufacturers' Research League and $10,000 to the National Council for Stream Improvement for research on this subject. The company's investment in the plant for treating the spent liquor has amounted to $1,400,000. Therefore, we have invested more than $3,200,000 in sulphite liquor treatment and research.

In spite of this investment and continued effort, Marathon's chemical division operated at a loss every year until 1945. This was 18 years after we started work on the problem. Since 1945 the chemical division has made a moderate profit, but it still falls far short of having made up the losses previously accumulated.

I hope that this brief outline of our experience has shown you the attitude of one unit of the pulp and paper industry toward abating a particularly stubborn type of pollution. Also, I hope that it has indicated our strong desire to clean up the streams of our state. * * *

In their sincere desire to clean up pollution — a desire which the pulp and paper industry shares — some groups in Wisconsin have indicated their belief that a genuine crisis exists. However, we do not see any evidence of such a crisis. We know of no sudden increase in pollution nor have any hitherto unsuspected harmful effects shown themselves recently. The situation has developed slowly over a long period. The Wisconsin River has not suddenly crossed over a line separating tolerable and intolerable.

There is no public health problem, much less a public health crisis, involved in pulp and paper mill pollution. This pollution as it exists in the Wisconsin River may cause some nuisance of odor and appearance at times and in some places, but it does not cause or carry any disease or shorten people's life span. State authorities have repeatedly said that industrial pollution of the type present in Wisconsin River has no appreciable effect upon human health. So an immediate and drastic clean-up is not needed to save human life.

Excerpts from statement of Stanton W. Mead, president of Consolidated Water Power & Paper Co.

We of Consolidated take pride in the participation of our company during both past and present years in the growth of industry in the Wisconsin River valley, in the correct and efficient utilization of the natural resources situated in the area and available to it, and in the happiness and well-being of the people residing in the area. Our principal manufacturing plants are located at points on the river, our source of primary power is the river and its reservoirs, our main office is at Wisconsin Rapids. The Wisconsin River cradles splendid power and paper industries, and our company is prominent in those industries.

Our paper and pulp mills require tremendous quantities of water for use in our various steps of operation, as do other such mills. We consequently face the problem of disposal of this process water, which by necessity carries off that portion of the wood which has been dissolved in the pulping process and some suspended solids. Without the right or permission to use the water and to return it to the river in the used form that it necessarily takes, our plants could never have been situated where they are. Nothing of what we have done in the way of building up a business and contributing to the prosperity of the area could have been possible. It was the availability of the river water and of the river itself as a disposal agency which were the primary requisites for the original installation of our properties and for all subsequent additions.

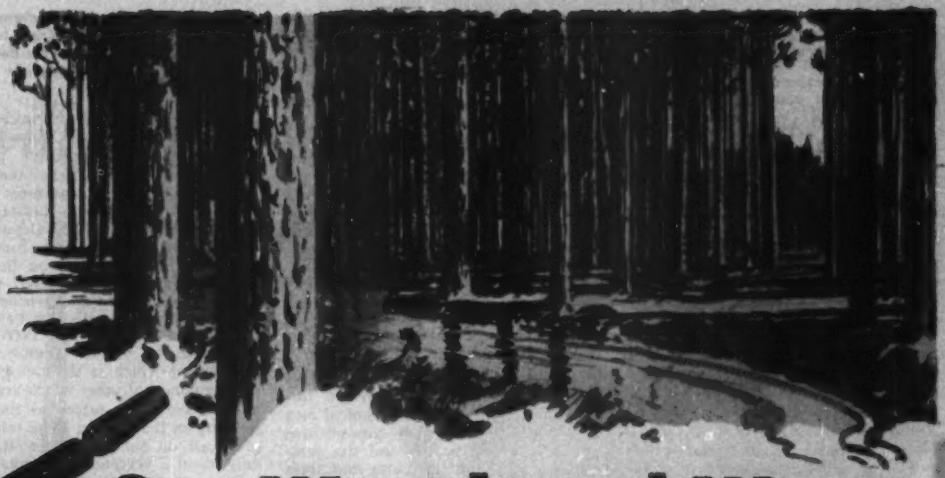
It is pretty generally true that as fast as means for reducing the volume of pollutional discharge have become known and practical we have adopted them in our company. Our history provides instance after instance of our company's initiative in used water treatment, in original experiment, and in the sustained pursuit of means to reduce pollution. We have in operation some of the finest and most expensive equipment for clarifying water prior to discharge and we employ the most modern techniques. Our program includes all departments of the mills and we have corrected situations often overlooked or underemphasized, such as disposal of coarse screenings and woodroom wastes. The representatives from the State Board of Health have offered no particular criticism of any of the discharges from our mills except spent sulphite liquor. Spent sulphite liquor exists at only one of our Wisconsin River mills, that at Wisconsin Rapids, because only at the one mill do we make sulphite pulp on this river.

The problem of disposal of spent sulphite liquor exists wherever sulphite mills are operated. Wood from the forests provides the highest yield and the most practical supply of cellulose fiber which constitutes the principal raw material of the paper industry. Approximately one half of the oven dry weight of pulpwood is cellulose fiber. In the sulphite pulping process we release this fiber from the body of the wood by dissolving away the lignin which nature has used to cement the fibers together, and along with it any other non-fibrous matter. The resultant solution is spent sulphite liquor. Even though half of the wood is thus discarded, wood still remains the source of highest known cellulose fiber yield. It is not because of wasteful practices or cheap raw materials that we are faced with this disposal problem of spent sulphite liquor. The problem is big simply because the volume of fiber required for the world's paper needs is so tremendous. The mills which our company operates are large mills. The material which we discharge in solution comes from really large quantities of wood.

The volume of sulphite pulp produced per operating day in our mill has been averaging 126 tons. Semi-chemical pulp production has been averaging 36 tons, groundwood pulp production at three mills totals 176 tons, and we procure 119 tons of pulp from other sources. All the above quantities of pulp are consumed at our four paper mills, commonly called divisions, and located at Wisconsin Rapids, Biron, Whiting, and Stevens Point. The total volume of paper produced per operating day has been averaging 853 tons, divided into 705 tons of book paper and 148 of other grades. Notice that manufacturing 126 tons of sulphite pulp daily on this river constitutes the basic process which enables us to produce 853 tons of paper. The sulphite fiber is extended to nearly seven times its weight in the form of paper.

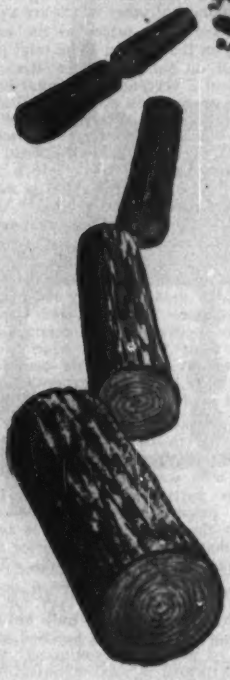
Sulphite mills are making real strides toward discovering the proper technique for reducing the pollutional effect of spent sulphite liquor. The state law specifically gives to your committee authority to assist all industry to find economical and practical methods for treating wastes. We have had the assistance of your committee's technicians, and their helpful recommendations for all our waste water treatments except spent sulphite liquor. The reason why they have made this notable omission is obvious. The problem presented by spent sulphite liquor has eluded solution, by the state's experts as well as by our industry's. I am sure that no person who is well informed on the subject will feel that either the sulphite mills or the Committee on Water Pollution has been lacking in energy or has been less than wholehearted in the pursuit of this solution.

At the present time our company is installing a spent liquor collection and storage system at our Appleton sulphite mill. It has been carefully



Wood and Water

Basic Necessities in Pulp and Paper Manufacture



The fast growing forests and numerous streams of the Seaboard Southeast make this the favored section of our nation for the pulp and paper industry.

Other advantageous factors include excellent transportation, low cost fuel and power, ample labor supply and good living as well as working conditions.

Seaboard's Industrial Department has helped some of the nation's outstanding companies in their plant locations studies. We know the *good* locations.

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THROUGH THE HEART OF THE SOUTH

planned and the materials carefully selected to handle this fluid in the volume required and with equipment which will hold up under continuous and almost perpetual operation. We have allocated some $70,000 to this collection and storage installation alone.

At the same time our company's staff men have been applying themselves to the subsequent steps of treatment. For this mill of our company the proper method seems to be evaporation and burning. Because only 14 percent of the liquor is solids, namely, dissolved wood materials plus some sulphur and limestone, the evaporation process has to boil away six-sevenths of the water to get the required density. What if we heads of families had to boil off that much of the waste water from washing dishes every day prior to disposing of it through an oil burner? You know, of course, that this evaporation of sulphite waste liquor is now possible, and the development of equipment that will do it is the discovery which has given us new hope and enthusiasm in our pursuit of the problem.

Burning trials of the condensed fluid in our company's boilers at Appleton have been conducted recently and have been observed critically and analytically by experts from the entire industry and from outside engineering firms. Kraft pulp mills have had experience in burning their own particular type of condensed spent liquor; but their solids contain sodium instead of lime, which makes the problem much simpler. Kraft mills also recover a smelt composed of sodium and sulphur which they reuse in processing, whereas no smelt forms when sulphite waste liquor is burned. As a final test at our Appleton mill, one boiler ran exclusively on condensed spent sulphite liquor for 20 hours which exhausted our storage capacity of the material. We now have pretty good knowledge on how to spray it in, how hot it has to be, how much steam is required to atomize it, how many jets to use and where to put them, how much forced draft is necessary, how hot the air must be, how stable the combustion is, what the limits of variation are, how to prevent settling out of only partially burned solids, what to expect as to slagging and scaling of boiler tubes, and of course equally important, how much it is worth as fuel. Its fuel value depends on its BTU content and how efficiently it burns.

It is true that we have today a much better conception of what we need for all this processing than we had a year ago. While we cannot hope our installation at Appleton can be as efficient as one which we may be able to design after more experience, yet we expect to go ahead with it as an experiment from which we can draw information that will be of great value. We are willing to install the basic equipment and hope that the later improvements won't be too revolutionary or costly. What we have to do at Appleton now is to order the evaporators, prepare a site for them and a building, set them in place and connect them up, and then proceed to learn how to operate them. Concurrently with the evaporator job is the job of reconstructing the combustion chambers of two boilers and equipping them with liquor-burning jets. To use up the expected volume of liquor will require running these two boilers practically continuously. A queer little wrinkle that upsets things is that there will be times when we can't use the steam from these two boilers without shutting down our bark burning boilers. We can't throw the bark into the river either, so that becomes a problem of real consequence.

To those in our company who have spent many hours of study on this project, as well as those technical men and engineers who have concentrated on the drafting boards and the catalogs in designing the parts and their relationship to one another and to the mill, it seems proper and wise to tackle one installation at a time. We simply can't see the sense of pioneering on two experimental evaporate-and-burn plants at once in the same company. It is the intention of our company's management to predicate our sulphite program on the Wisconsin River on the proven progress which evolves on the Fox River, particularly progress in our own Fox River mill. It seems to us that such a policy is more substantial and has a much better chance to succeed in reducing sulphite pollution to an acceptable minimum on a sound basis than could a more arbitrary policy predicated on any philosophy other than that made up of tangible technical advances.

Beyond dispute, paper manufacture is one of the cleanest of all production industries and is one of the most generally beneficial that an area can have. Certainly the people of Wisconsin appreciate the value of the pulp and paper industry and want to encourage it in correct efforts to reduce pollution.

They should have it pointed out unmistakably that a research budget can take care of the costs in laboratory or pilot plant, but that when an industry expands its experimental efforts at reducing pollution to a full commercial scale, it is doing something that can be dangerous not only to the experimenter but also to the entire cause of stream conservation. Because commercial scale costs run into huge figures, any mistake made on this scale will inevitably be serious and damaging. Such injuries leave lasting scars. If unwisely conceived or executed, such a course must in the broad sense and in the long run impede progress toward eventually and soundly solving the problem of stream pollution.

I am confident that the people of this state are too intelligent to attempt to handle by sheer discipline a problem which only science can solve.

Excerpts from general statement of Wisconsin River Valley Kraft Mills by C. G. McLaren, Vice President and General Manager, Container Corp., Wisconsin.

The Wisconsin kraft mills were among the first in the United States and enjoyed a competitive position equal to that of any of the other kraft mills until the large movement of the industry to the South in the slash pine regions, the greatest development of which came in about 1929. Since that time, the kraft industry on the Wisconsin River has found itself pressed to compete with the tremendously large modern fast mills that have been built in the South where there is an abundance of natural resources, the greatest of which is the fast-growing large volumes of pines which are available at very low prices to the kraft industry in that region. The total pulp produced on the Wisconsin River is only about 2 percent of the total kraft tonnage produced in the United States.

The yield from a cord of wood in our area is approximately 950 pounds per cord of wood while the yield on the southern pines from which the greater portion of kraft pulp is made is approximately 1,250 pounds. As a result of the more modern equipment and cheaper raw materials of the South it has been necessary for the mills on the Wisconsin River to enter the specialty paper field producing reasonably small volumes of specialized papers which of necessity must command a greater sales price and which lend themselves to smaller scale manufacturing; such papers in general being bleached grades and high-test papers.

At Tomahawk we manufacture a liner board in competition with the South, the pulp for which is augmented with waste paper in order to make us partially competitive. The average price per cord of delivered wood to the Wisconsin mills is over double that of the average price delivered to the southern mills. The average southern mill shows a wood cost of approximately $19 per ton of pulp while the average mill on the Wisconsin River shows a wood cost per ton of pulp of approximately $45. This interpreted in total manufactured cost for a ton of slush pulp ready for a paper machine, gives an approximate cost of from $34 to $35 per ton in the South against a cost of from $65 to $70 per ton in the mills on the Wisconsin River. The reason for bringing this up is to show that the Wisconsin industry has to be highly efficient in the converting of this slush pulp into paper products and has to make all possible savings in order to be competitive and remain in the kraft paper business. We feel that is one reason why the Wisconsin kraft mills have a very low waste loss both in chemicals and in fiber since the greatest incentive for anyone to be frugal and to save is to be forced to do so because of a low net income.

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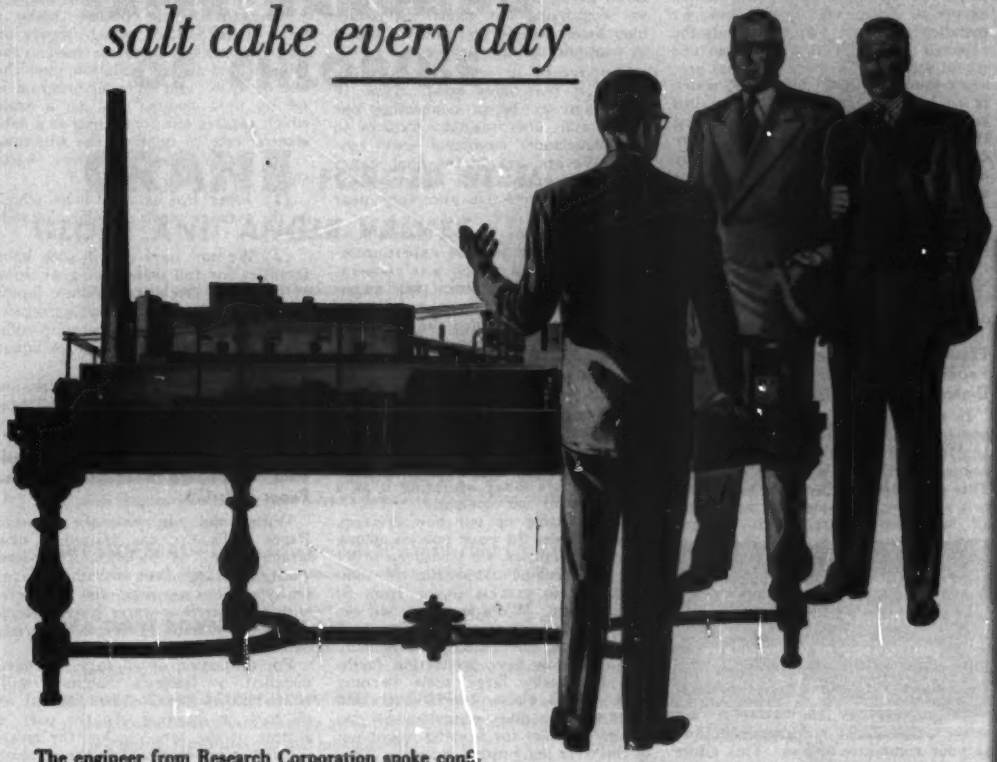

The engineer from Research Corporation spoke confidently. He had studied the equipment layout, and noted that the mill had a capacity of 1,000 tons of pulp per day. From his experience and specialized knowledge he knew that he could safely anticipate a minimum recovery of 100 pounds of salt cake for each ton of pulp produced—total: 50 tons of salt cake per day—value: $1,000.00 to $1,500.00 per day dependent upon salt cake cost prevailing at the plant.

Performance like this is the result of over 35 years of experience combined with careful engineering appraisal, attention to details and a remarkably efficient method. These, plus equipment which gives recoveries of 90 to 99%, are responsible for outstanding records of recovery.

If you are losing your chemicals through the stack in a soda or sulphate mill investigate the Research Corporation Precipitator.

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47 CARBON BLACK PLANTS
200 METALLURGICAL INSTALLATIONS
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Excerpts from a statement of Tomahawk Pulp Co. by C. J. Bronsted, Manager.

This company operates a small groundwood pulp mill on the Upper Wisconsin River at Kings Dam three and a half miles above Tomahawk, with from 25 to 30 employes.

Prior to the spring of 1950, our losses of fiber to the stream ran in excess of 2 percent. At that time we installed a refiner, which regrinds the rejected wood screen waste from our round screens. This unit at times presents some operating difficulties, which is to be expected in newly installed equipment. We are steadily reducing these troubles and in the near future expect the refiner to operate efficiently and steadily. Tests made when it is working to capacity show a fiber loss of about 0.5 percent. When we have the unit working properly, we can promise that our total result will be just about 0.5 percent. This figure is well within the standard which the Committee on Water Pollution has indicated is acceptable.

Excerpts from a statement of Ward Paper Co., Merrill, Wis., by R. A. Diehm, Executive Vice President.

In a normal day of operation at the present time, according to the state analysis, the fiber loss is 1.62 percent compared with 2.74 percent a year ago. This improvement has been made with new screening equipment. A new save-all has been ordered with delivery promised for April 1, 1951. It is guaranteed to reduce fiber losses to a maximum of one-half pound per one thousand gallons of water. If this can be realized, the fiber loss should be reduced to 0.5 percent.

Statement for Rhinelander Paper Co. by Robert F. Nelson, Vice-President.

Rhinelander has long carried on an active program of reducing pollution, as your committee knows. This effort has continued to gain momentum and recently it became evident to the management that this would go even faster if it were made the specific responsibility of a separate group in the company. In consequence, a new division was created last summer and J. M. Holderby was employed to manage it. Your committee has known and worked closely with Mr. Holderby for 20 years. During this time he has successively served as assistant sanitary engineer of the State Board of Health, as superintendent of the Neenah-Menasha sewerage commission, as research coordinator of the Sulphite League and as general manager of the Lake States Yeast Corporation before coming to Rhinelander Paper Company early last summer. Certainly he is as well qualified to do an effective job as is anyone we could have found. Certainly we are earnest in our effort to reduce pollution as far and as fast as we are able.

Our record on suspended solids discharged to the river has been consistently good for a long time. During the six years 1944–49, the highest figure reported by the state surveys of our mill has been 1.21 percent in 1948, the lowest 0.83 percent in 1946. The six-year average is 1.02 percent. Thus for all of this period we have been close to or below the figure of 1 percent which your committee has indicated as an acceptable standard. We are continuing our efforts to reduce fiber losses still further and we expect to continue making progress.

Our record in respect to sanitary wastes is reasonably good. Some 10 years ago we began connecting our toilets and other sanitary fixtures to the Rhinelander municipal sewer system. We are now in the final stages of that program and I assure you it will be completed in the very near future.

We agreed to supply the sulphite liquor for yeast process experimentation at the plant which was cooperatively built by Wisconsin pulp manufacturers, adjacent to our pulpmill, and have steadily aided the operators of that plant in many ways without cost. Last summer, when it became apparent to ourselves and other companies associated in the yeast venture that it might progress faster and more surely as part of a single company instead of under committee management, we purchased the yeast process plant and are today operating it as a subsidiary of our company.

After setting up our new division, which includes the yeast process among its responsibilities, we placed an order for a Rosenblad evaporator of sufficient size to process liquor from 50 tons of pulp. When installed, we expect to operate it continuously on both spent liquor and yeast plant effluent. We shall thus have production facilities for really large scale burning tests. We have also ordered driers and other supplementary equipment for use in our program for keeping liquor out of the river and putting it to use. Altogether, our company has spent or firmly committed $350,000 thus far in 1950 for activities aimed at reducing sulphite pollution.

In 1945 this company established at the University of Wisconsin a two year fellowship to study the possible use of lactic acid fermentation as a method of treating spent sulphite liquor. This study was carried to completion at a total cost to us of $3700. The results convinced the University scientists and our management that the project was less promising than torula yeast and so it was given up.

With the upsurge of interest in spreading sulphite liquor as road binder which came with increasing experience by the mills that employed this utilization in Wisconsin, Rhinelander Paper Company in 1950 purchased a tank trailer for use in hauling and spreading liquor on roads. Total expense has been about $5700 thus far, and we expect to expand this work next year to whatever extent we are able to induce township and county road commissioners and the owner of private roads to cooperate.

Our total payments to the League research program have totaled $44,000. Our total outlay for yeast plant and evaporation equipment adds up to $510,000. White water treatment for removal of suspended solids, and bark recovery equipment from our wood room, have involved a total of $62,000.

Altogether, these outlays make a total of $615,015.88 which stands on our company's books as devoted to the reduction of stream pollution since the end of 1936. Our over-all program is set up in a manner and on a scale which assures our continuing at a substantial rate to improve the situation.

To sum up our company's waste status:

(1) Fiber loss is at a level which on the average meets the official standards.

(2) We now have or will soon have facilities for full scale testing of three of the more promising sulphite liquor disposal methods. In the aggregate, these facilities will have capacity sufficient to take care of our entire liquor production.

(3) We have a company division which is charged solely with pollution reduction and waste utilization.

Statement by David E. Smith, President & General Manager, Wausau Paper Mills Co.

Within the past year the Wausau Paper Mills Co. has started a new bleach plant. It included a modern washing arrangement with three vacuum-type de-waterizers and washers, with a counterflow water system which allows a minimum of fibrous materials to reach the river.

For utilization of all bark, we have installed a Jeffery's hammer mill, which makes possible the disposal of all bark by burning. In the past, a portion of the bark reached the river.

Further improvement in the sulphite mill was made on an inclined screen in use for screening of the waste sulphite liquor. Additional baffles, showers, and dams were added to permit the screening of all waste liquor. We are also experimenting at this time with the Robbins Conveyer, Inc., with a new elliptic dewaterizer type of screen of stainless steel construction with a new type of plate. This screen is relatively new in the paper industry, but has met with considerable success in other industries.

For recovery of unscreened rejects, we have built and installed a new chip shredder. The installation has been put into operation and its performance looks very promising. Improvements now in the planning stage should make possible complete utilization of all rejects.

Our laboratory and technical departments have spent considerable time and money on the project of ammonia base pulping. All of the experimental data have been completed and arrangements

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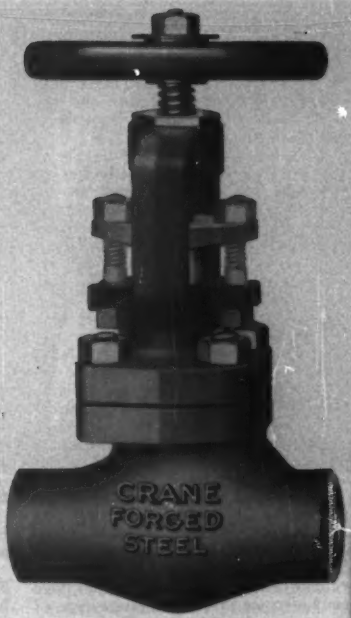

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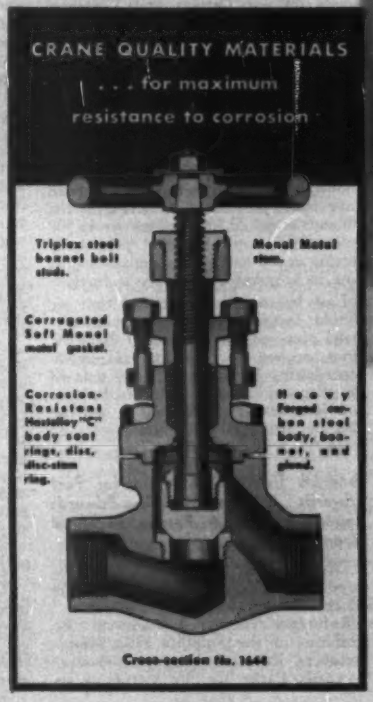
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have been made to make initial mill scale trials. At this date these trials are in progress. As far as we know, this is the first large scale trial run on ammonia base pulping in the Middle West on a commercial basis. The object is a comparison with the calcium-magnesium base as currently used.

The theory behind this test is to explore the economic possibilities of operating a sulphite pulp mill on this base and to test the large over-all factors of operational and maintenance problems encountered. The ammonia handling equipment alone cost $20,000. The special digester linings, etc., will undoubtedly increase the total cost of the experimental trial by another $35,000 to $40,000. The over-all cost factors will be undetermined for many months, and only when these are determined shall we be able to obtain the answer to the problem of whether it is economically possible through theoretically possible better yields to offset the tremendous additional cost of ammonia over lime.

In the paper mill, we have made improvements toward reducing the amount of effluent. On one of the machines, we have installed a new Bird screen, with high-pressure, low-volume showers. On the other two machines, we installed the new type of showers in the older type Bird screens. All of the machines have a similar type of wire shower, manufactured by Emerson, recently installed. On the Bird savealls, we have installed one new cylinder and have rebuilt those on the other two machines. Rearrangements on our Dirtecs and Vortraps, now in progress, will allow a minimum of waste to reach the river.

A new pumping arrangement between the white water of the paper mill and the pulp mill, now being installed, will make possible the use of a large amount of the paper mill white water for dilution purposes of bleaching stock after the bleach plant. The above list of changes in the paper mill have made possible a reduction in the effluent from 22,500 gallons to 11,500 gallons per ton of paper, practically cutting it in half. The improvements now in progress will reduce it further.

Last but not least, we feel that we should mention the new sewage-disposal plant of the Village of Brokaw, since we are the principal taxpayers, contributing 95.9 percent. The cost of the disposal plant is $50,000. Its size and location are such that it will be able to process all sanitary sewage from the mill and village.

Excerpts from a statement for Port Edwards Mill of Nekoosa-Edwards Paper Co. by T. A. Pascoe, Technical Director.

The company's sulphite mill is located in the Village of Port Edwards on the Wisconsin River.

Reference has been made to the activities of the Sulphite Pulp Manufacturers' Research League. Nekoosa-Edwards Paper Co. by virtue of its operation of a sulphite mill has participated financially and technically in all of the activities of this group since its formation.

In addition to our regular contributions to the Sulphite Pulp Manufacturers' Research League, we also assumed a proportionate share of the capital outlay in the construction of the yeast plant at Rhinelander. The combined expenditures represented a total of $84,000, which does not take into consideration technical and executive time and expense in attending the numerous meetings necessary for the League's functions.

Certain individual Nekoosa-Edwards Paper Co. projects so designated to distinguish from League activities have been carried out in this field, the results from which have been made available to the League or the general industry.

In the fall of 1949, Nekoosa-Edwards Paper Co. loaned the services of Frank Coldwell, assistant superintendent of the power department, for six weeks. He was one of a party of three sent to Europe by the League to investigate Scandinavian and other European practices in the waste sulphite liquor field.

In the spring of 1950, Nekoosa-Edwards Paper Co., together with the League and Combustion Engineering Superheater Corp., conducted mill-scale burning trials on concentrated waste sulphite liquor in our Nekoosa mill. These tests were quite successful in a technical sense and when considered as a single step in the whole cycle of liquor collection, evaporation and burning of this material. The results pointed out other technical and economic factors, however, that still require further study. Briefly, the trials showed that 52 percent solids waste sulphite liquor could be atomized mechanically or with steam and burned in a modern water-walled pulverized coal-fired furnace if coal was fired with it in an amount to account for about one-half the current steam production. The overall efficiency of the unit was markedly reduced from the regular performance of the furnace when fired with coal.

Consideration of Pollution Reduction Measures: Nekoosa-Edwards Paper Co. has followed closely the work carried out by the League and others dealing with the various possible pollution reduction measures that have been proposed and considered over the years. This has been done in order to keep us oriented as to which system seemed to best fit our conditions. From all currently available information, we have arrived at the following conclusions regarding the most discussed pollution reduction proposals:

1. *Utilization of Waste Sulphite Liquor as Source of Organic Chemicals:*

This would utilize only an insignificant quantity of material available at one mill. Involves many technological unknowns and would require a sales force to dispose of product. Degree of abatement possible is unknown.

2. *Disposal Using Treatment on Trickling Filter:*

Size of installation to treat all of product would be enormous and would involve large capital outlay and maintenance. Cost of nutrients for operation would place pulp costs out of competition. Serious questions arise concerning operation of this system in this climate.

3. *Ponding:*

This method, from its nature, would require large areas of suitable soil substructure well isolated from settled communities because of odors developed and danger of contaminating ground water. There are no known ways to dry and collect sludge formed and prevent filling up of storage areas.

4. *Alcohol Production:*

The cost of producing alcohol by this process is not competitive in normal times with the product from other sources. The usual added cost that has been experienced would add a burden to the pulp cost that would place it out of competition.

5. *Yeast Production:*

Although this proposal is by far one of the most promising of many, there are some factors involved that do not appeal to us and do not seem to fit our conditions best.

The disposal of the product would require a special sales force. The sales would be subject to the vagaries of a market not related to our industry.

For near complete abatement of pollution it would require the purchase and operation of an evaporation and burning plant in addition to the yeast propagation plant.

6. *Evaporation and Burning:*

Of all the current plans discussed, this one now appears to meet the most of our requirements.

Nekoosa-Edwards Paper Co. recognizes that there are still certain technological problems and economic factors that must be worked out before a mill-scale evaporation and burning plant could be operated without interruption of pulp mill operations or the incurring of a prohibitive financial loss. Some of these factors are: a substantial increase in digester-strength liquor solids, more information concerning the proper design of furnace burners and combustion chambers, longer time operating experiences as related to fouling of furnace heating surfaces, the minimum auxiliary fuel required when using a water-wall furnace, more complete information on the catching of fly-ash, the possibilities of air pollution, and positive experience regarding furnace and/or stack corrosion.

Our present position from a careful consideration of the evaporation and burning question is that Nekoosa-Edwards Paper Co. is willing to continue to support financially and with the efforts of its own staff investigation along lines designed to provide answers to such problems. We respectfully submit that no expenditures should be directed until answers to most of the unknowns which I have discussed are available.

ASSOCIATIONS

MARK ADDRESSES OHIO TAPPI

The November meeting of the Ohio Section of Tappi was held at the Manchester Hotel in Middletown, Ohio, December 12. The 125 Tappi members and their guests present were treated to an excellent lecture on fiber to fiber bonding by Dr. Herman F. Mark, Professor of Organic Chemistry, and Director of the Institute of Polymer Research, of the Polytechnique Institute of Brooklyn.

Dr. Mark opened his address with the question: "Why and how can two fibers adhere to each other?" In explaining to the group the possible ways that fibers can bond together Dr. Mark cited four factors that enter into the adhesion of one fiber to another. These factors of adhesion are discussed in order below:

1. *Mechanical*

Mechanical attraction consists of the interaction of one fiber to another by means of the friction of their surfaces. Obviously interlocking or twisting of fibers can give some apparent adhesion. An example of this type of adhesion would be the long twisted fibers of rope which are held together by the friction of the fiber surfaces and the pressure of fiber against fiber because of the twisting the rope has undergone. In this case there is no actual attraction fiber to fiber but there is frictional resistance against separation. Other examples employed by Dr. Mark to illustrate mechanical attraction consisted of glass and steel. When two pieces of glass or steel are pressed together there can be enough friction, depending on the pressure applied to the blocks, to prevent separation of the blocks parallel to their plane of union. Again in this case, there is no actual attraction; and the blocks may be separated by merely lifting one from the other.

2. *Polar Attraction*

When two fibers are pressed close together natural forces of polar attraction are caused due to the attraction of positively and negatively charged particles. Carboxyl and hydroxyl groups are responsible for polar attraction in cellulose. In this case we have actual forces of attraction in operation. Polar forces decrease rapidly with distance, and the distance cannot be greater than four or five Angstrom units for polar attraction to take place. In the case of polar attraction, a force of 2000 calories per mole is required to dissociate the attracting bonds.

3. *Hydrogen Bond*

When fibers are pressed still closer together, in the neighborhood of two to three Angstrom units, the hydrogen and oxygen atoms in adjoining cellulose units can attract and unite in close linkages of much stronger proportions. This form of linking is known as hydrogen bonding. In this case energies of 5000 calories must be expended to dissociate the bonds.

DR. HERMAN F. MARK

4. *Chemical Bond*

When cellulose fibers are brought together with distances as little as one and one-half Angstrom units, hydroxyl groups can be joined together with the elimination of water. Here a true chemical bond is formed requiring 30,000 calories for dissociation. In this case cellulose fibers can be interlinked by other bonds. An example of this type of linkage is the parchmentizing of paper with sulphuric or phosphoric acids.

In summarizing these four methods by which fibers can adhere one to another Dr. Mark presented a simple table listing the forces as shown below:

Type of Bonding	Order of Distance	Calories per Mole for Dissociation
1. Mechanical	Very large	Very small
2. Polar Bond Attraction	4-5 Angstrom units	2,000
3. Hydrogen Bond	2-3 Angstrom units	5,000
4. Chemical Bond	1-5 Angstrom units	30,000

It can be seen from the above that if the surface area decreases the bonds become stronger and stronger and force required to break the bonds must be greater.

Having presented a brief theory of fiber to fiber bonding, Dr. Mark went on to discuss the importance of each bonding factor in the wet strength of paper. The discussion of these factors was in the order given above for the theory.

1. Mechanical adhesion fiber to fiber is not a molecular force of attraction, and any wet strength depends on the degree of interwining and swelling of the fibers. If there is no swelling, strength is decreased by wetting. It is quite evident that the short fibers from which paper is composed cannot be twisted firmly together; and therefore mechanical bonding will not resist water.

2. Polar bonds are weakened by water, since water is a polar molecule and can enter into the polar bond itself. The polarity of water satisfies the hydroxyl and carboxyl bonds; and thus eliminates the fiber to fiber attraction.

3. Hydrogen bonding is not effected as much by wetting with water because the distances involved are too close for the water molecules to come between the bonding groups. Hydrogen bonds are thus resistant to wetting; and this is the reason cellulose is not soluble in water. Thus cellulose cohesion is mainly due to the hydrogen bonding in the cellulose molecule. There are really very few hydrogen bonds uniting fibers in paper, while cellophane has many. Cellophane can be thought of as a mass of matted molecules, and not fiber. The distances with which the cellulose units are separated in cellophane is thus very much less than the distances encountered in fiber to fiber bonding in paper. Cellophane swells in water but does not disintegrate; but an increase in the activity of the water by heating can cause cellophane to dissolve.

4. The ether linkage met with in chemical bonding is more resistant to water than is the hydrogen bond. As mentioned before, sulphuric acid or phosphoric acid will eliminate water from cellulose and establish ether bonds. These ether bonds give wet resistant papers; but also tend to create sheet brittleness.

In paper we have factors 1 and 2 and some of 3 contributing to fiber bonding. In most papers it is undesir-

(Continued on page 39)

Financial News

Bathurst Power & Paper Co. estimated net profit for the nine months ended September 30, 1950, was up 42.2 percent from the corresponding 1949 period, amounting to $1,802,771 against $1,266,960.

Earnings per Class A share were $3 against $2.45 and per Class B share $1.86 against 95c. Taking into consideration the participating feature and the $4 per annum maximum rate payable on Class A, earnings per share before participation were $4.51 against $3.17.

A large part of the improvement over last year occurred in the third quarter. The $768,450 net for that quarter was 95 percent over the comparable 1949 period and represented 42 percent of the total nine-month net.

Current assets at September 30 totaled $10,857,855 against $9,958,934 a year earlier, including $5,086,989 against $3,881,210 cash and securities. Current liabilities were $3,313,075 against $1,650,763, leaving working capital lower at $7,544,780 against $8,-308,171.

Marathon Corp. reports that both sales and earnings reached the highest point in company history in the fiscal year ended October 31, 1950. Net sales in the year were $68,269,814, as against $60,048,380 in the preceding year, and net earnings were $6,536,036 as compared with $4,519,217 the year before. After preferred stock dividend requirements, the 1950 earnings were equal to $4.84 a share on 1,300,000 shares of $6.25 par value common stock outstanding, compared with $3.29 a share on the same basis in 1949.

STOCK REPORT

	Per Share Earnings: Calendar Year 1949	Per Share Earnings: 12 Mo. to Approx. 9/30/50	Indic. Annual Divid. Rate	Jan. 3 Approx. Market Price
PREFERRED STOCKS				
Armstrong Cork Co. $3.75 Cum.	$40.95*	$48.14a	$3.75	$102⅜
Armstrong Cork Co. $4.00 Cum. Conv.	40.95*	48.14a	4.00	114½
Celotex Corp. 5% Cum.	6.96c	8.75a	1.00	16½
Champion Paper & Fibre $4.50 Cum.	60.09f	97.99	4.50	105⅜
Container Corp. of Amer. 4% Cum.	89.52	122.92	4.00	105¾
Crown Zellerbach $4.20 Cum.	54.38c	66.87	4.20	103½
Dixie Cup Co. $2.50 Cum. Conv. Cl. A	10.93	13.70	2.50	52¼
Flintkote Co. $4 Cum.	62.70	79.70	4.00	105
Robert Gair Co., Inc. 6% Cum.	13.79†	17.21†	1.20	18⅜
International Paper Co. $4 Cum.	224.55	323.40	4.00	107⅛
Kimberly Clark Corp. 4% Cum.	85.27	124.87e	4.50	107
MacAndrews & Forbes 6% Cum.	61.59	63.03	6.00	139
Mead Corp. 4½% Cum.	51.37	88.30	4.25	94½
Mead Corp. 2% Cum. Conv. 2nd	21.35*	36.20*	2.00	62
Pabco Products, Inc. 4% Cum. Conv.	56.46	124.88	4.00	100½
Rayonier Inc. $2 Cum.	9.54	17.45	2.00	36½
St. Regis Paper Co. 4.40% 1st A	30.74	52.38	4.40	95⅜
Scott Paper Co. $3.40 Cum.	51.15*	62.16*	3.40	99¾
Scott Paper Co. $4.00 Cum.	51.15*	62.16*	4.00	106½
Sutherland Paper 4½% Conv.	46.92	68.59	4.25	115¾
U. S. Gypsum Co. 7% Cum.	283.37	429.37	7.00	181½
United Wallpaper Inc. 4% Cum. Conv.	2.14	(d)17.15	2.00	25½
West Virginia Pulp & Paper 4½% Cum.	61.28c	61.06i	4.50	109⅜
COMMON STOCKS				
APW Products Co.	(d)0.81	0.45	—	7¼
American Writing Paper Corp.	.04	0.86	0.50	8¾
Armstrong Cork Co.	6.37	7.84a	3.75	47⅜
Celotex Corp.	1.65c	2.20a	1.00	14⅜
Certain-Teed Prods. Corp.	2.84	3.43	1.50	14½
Champion Paper & Fibre	5.15f	8.93	2.45	49½
Congoleum Nairn Co.	3.04	2.70a	2.00	24½
Container Corp. of America	4.23	5.14	2.50	34⅛
Crown-Zellerbach	6.02c	7.36	2.20	48⅞
Dixie Cup Co.	7.44	9.87	1.50	45⅛
Eastern Corp.	0.04	3.04	1.00	19½
Flintkote Co.	4.33	5.48	3.00	25⅛
Robert Gair Co., Inc.	2.11†	2.69†	0.70	13½
Great Northern Paper Co.	4.87	3.73	3.00	46⅛
International Paper Co.	7.12	8.65	2.50	52⅞
Johns-Manville Corp.	4.83	6.38	3.50	48⅞
Kimberly Clark Corp.	5.29	6.81e	1.80	45⅛
MacAndrews & Forbes Co.	3.64	3.74	3.00	41¼
Marathon Corp.	3.29c	4.84e	1.40	38¾
Mead Corp.	4.10	7.32	2.20	24⅛
National Container Corp.	0.95	2.00	0.75	11⅜
Pabco Products, Inc.	0.85	1.95	0.60	17⅜
Rayonier, Inc.	4.75	9.73	2.50	48
Ruberoid Co.	7.93	8.65	3.18	48⅜
St. Regis Paper Co.	0.91	1.63	0.80	12⅜
Scott Paper Co.	6.07	7.12	3.60	44¼
Sutherland Paper Co.	4.62	6.47	2.75	45½
Union Bag & Paper Corp.	5.01	6.68	3.00	38⅞
United Board & Carton	(d)1.61b	1.56j	0.50	18½
U. S. Gypsum Co.	13.51	17.87	10.00	106½
United Wallpaper	(d)0.01	(d)0.57	—	3¼
West Virginia Pulp & Paper	8.58c	8.36i	5.00	77¼

(a) 12 months to approximately 6/30/50
(b) Year ended 11/13/49
(c) Year ended 1/31/50
(d) Deficit
(f) 9 months to 12/31/49
(h) Declared 25c payable Sept. 1, 1950
(i) 12 months to 7/31/50
(j) 12 months to 11/11/50
(*) Earnings per combined preferred shares
(†) Includes domestic and Canadian subsidiaries and 60% equity in Southern Paperboard Corp.

1950 ECA AUTHORIZATIONS

WASHINGTON, D. C.—Pulp and paper procurement authorizations by the ECA during 1950 totaled $112,700,000 to November 30, the agency reported at the year-end.

Procurement in November alone totaled $100,000, said the ECA.

NEWSPRINT TO GERMANY

WASHINGTON, D.C.—Paper, pulp and related products exclusive of newsprint, totaling $1 million, was authorized for procurement in this country and Canada for export to Germany during the first 10 months of 1951, in an ECA action this week.

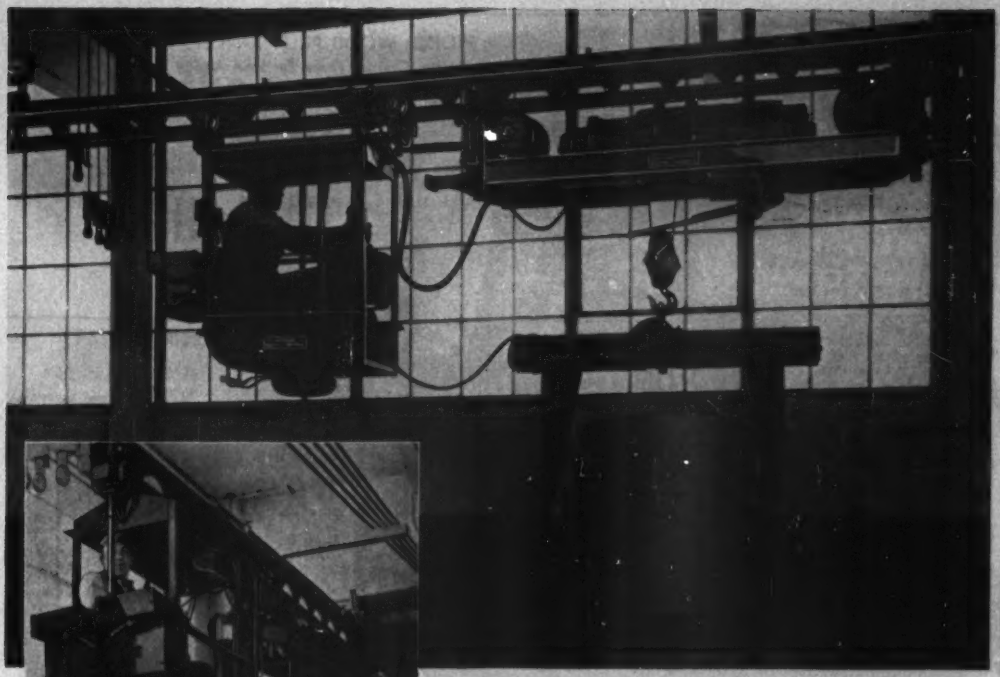
BARK FOR MULCHING

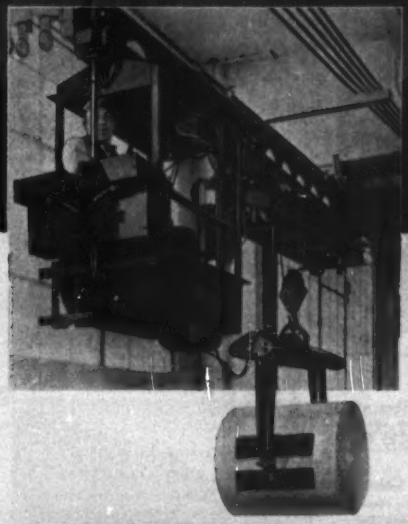
Brown Co. has provided an initial grant of $6,000 to the University of New Hampshire for a 2-year project on the possible use of bark for soil conditioning and mulching. Present evidence shows that mulching with bark has reduced, and, in some cases, completely eliminated what is known as "apple-scab." Effect of bark for mulching is longer than hay, straw, etc. Two carloads of bark have been shipped to the U. of N. H. and 3 truckloads are being used in experiments at West Stewartstown, N. H., for mulching experiments.

U. S. DYE PRODUCTION

WASHINGTON, D. C. — Production of peacock blue lakes dropped slightly in October to 231,524 pounds from 238,-833 pounds the previous month, the U. S. Tariff Commission reports.

Dye production for October and September, from synthetic organic chemicals output, in pounds, was respectively: direct black, 1,218,245 and 726,833; naphthol, 91,179 and 57,079; chrome blue black, October only, 71,-953 pounds.





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OVERHEAD MATERIALS HANDLING EQUIPMENT

PRICES

The prices below reflect market quotations in New York at the mill level on standard grades. Most orders accepted, however, at price prevailing on date of shipment. Does not include spot offerings.

PAPER AND BOARD

Standard News, Delivered Parts

Rolls, contract, per ton	$105.00/110.00
Sheets	

F.o.b. Mills. C.l. Frt. allowed, dock, N. Y.

Kraft— pr cwt., 40# base wgt.

Standard Wrapping Rolls	$7.75/ —
No. 1 Wrapping Rolls	8.25/ 8.50
Standard Bag	7.50/ —

Tissues— per ream 24x36 (480) 10 lbs. 2500 lbs or more

Wh. No. 1 Frd.	$1.85	/$2.50
Wh. No. 1 MG	1.85	/ —
Wh. No. 1½	1.75	/ —
Wh. No. 2	1.65	/ —
Kraft Non-Tar	1.70	/ —
White Non-Tar		

Toilet— per case of 100 rolls—1 M sheets

Unbleached 4½x4½	$8.00/$8.25
Unbleached 4½x5	6.05/ —
Bleached 4½x4½	7.10/ 8.80
Bleached 4½x5	9.10/ —
Per Case of 50 rolls—2000 sheets	
Unbleached 4½x4½	$8.00/$8.25
Bleached 4½x4½	6.95/ —
Per Case of 100 rolls—1000 sheets	
Facial, 4½x5, 2 ply	$8.95/$9.85

Paper Towels— per case of 3750

Wh. Jr. M'tif'd 9¾x9½	$5.65
Br. Sr. M'tif'd 10x12	6.90
Br. Jr. M'tif'd 9½x9¾	3.50
Br. Jr. Sqt. fold 10x10¾	3.35
Bichd. 7¾x11, 24/25 rolls	$6.90/7.00

Manila, per cwt.

No. 1 Jute Tag sheets*	$16.55/18.55
Reg. Jute M.F. 40-lb., sheets*	15.00/17.00
Wrapping Manila	8.75/ 10.50
Printing Manila	10.50/12.00

* Less usual allowance for rolls.

WORLD WOOD PULP MARKETS

Fourth Quarter Contract Prices, Per Short Air-Dry Ton

	Varying freight allowances		Atlantic Ports		
	U. S.	Canadian	Swedish	Finnish	Norwegian
Groundwood	$85.00/100.00	$85.00/100.00			
Sulphate, Bleached	135.00/200.00	175.00/ —	180.00/ —		Competitive
Sulphate, Unbl. Northn.		140.00/155.00	153.00/165.00		
Sulphate, Unbl. Southn.					
Sulphite, Bichd. (Sftwd.)	135.00/165.00	145.00/ —	179.00/ —	Competitive	Competitive
Sulfite, Bichd. (Hdwd.)	150.00/175.00	132.50/150.00			
Sulphite, Unbichd.	132.50/150.00		157.00/ —		
Sulphite, Unbl'd (Glassine)		140.00/142.50			
Soda, Bichd.	140.00/142.50				

* On dock. † Delivered.

Gummed Tape— per bdl., 500 bdls. or more

90-lb. 375 ft. GSI	$6.90 / —
60-lb. 600 ft. GSI	6.90 / —
35-lb. 800 ft. GSI	7.93½/ —
35-lb. 500 ft. GSO	5.98 / —

Boards, per ton—

Filled News	$102.50/107.50
Plain Chip	105.00/107.50
Bichd. Mla. L-d. Chip	132.50/147.50
White Pat. coated .020	155.00/170.00
Kraft Liners 42 lb.	115.00/117.50
Kraft Corr. .009	122.50/126.00
Binders Boards	137.50/140.00

The following prices are representative distributors' resale prices:

Rag Content Bonds and Ledgers—
White, 20 lb.

	Bonds 4 Cts.	Ledgers 4 Cts.
	per cwt.	per cwt.
100% Rag Ex. No. 1	$70.45/ —	$72.65/ —
100% Rag	62.45/ —	63.90/ —
75% Rag	48.15/ —	49.40/ —
50% Rag	38.90/ —	40.20/ —
25% Rag	31.65/ —	33.00/ —
25% Rag	29.75/ 30.00	

Sulphite Bonds and Ledgers
White, 20 lb.

	Bonds 4 Cts.	Ledgers 4 Cts.
	per cwt.	per cwt.
Watermarked	$19.05/$19.85	$31.15/ —
Plain	18.05/ —	19.35/ —

White Bond

	Conversion Coated	Machine Coated	Uncoated
	Case	Case	
	per cwt.	per cwt.	
No. 1	$33.40/$34.65	$18.15/ —	$19.15/ —
No. 2	21.90/ 23.40	16.15/ —	17.90/ —
No. 3	21.15/ 22.40		
No. 1 Antique (Watermarked)			$19.15/ —
Offset			17.90/ —
A Grade E. F.			17.40/ 18.15
A Grade S. C.			18.15/ 18.65
B Grade E. F.			17.65/ —
B Grade S. C.			18.40/ —

‡ Indicates a price change.

WASTE PAPER MARKET

The following quotations were gathered from major dealers in each market. They are an indication of the price range in which volume tonnage was moving on the date specified. Prices to mills, per ton, f.o.b. cars shipping point (includes brokers' fee.) ALL PRICES NOMINAL. SPOT OFFERINGS OR SPECIAL PACKINGS NOT INCLUDED.

	New York	Philadelphia	Boston	Chicago
	Dec. 21	Dec. 22	Dec. 29	Dec. 12
No. 1 Mixed Paper	$32.00/ 35.00	$30.00/ 33.00	$29.00/ —	$33.00/ —
Boxboard Cuts	30.00/ 32.00	23.00/ 28.00	25.00/ 30.00	28.00/ —
Mill Wrappers	30.00/ 35.00	25.00/ 35.00	30.00/ 35.00	35.00/ —
No. 1 News	37.00/ 40.00	33.00/ 36.00	33.00/ 35.00	38.00/ —
Over-issue News	40.00/ 45.00	32.00/ 40.00	33.00/ 40.00	41.00/ —
Corrugated Containers	55.00/ 62.00	50.00/ 53.00	49.00/ 55.00	52.00/ —
New Corrugated Cuts	55.00/ 62.00	45.00/ 48.00	49.00/ 60.00	62.00/ —
Double Kraft Ld. Corr. Cuts	100.00/110.00	90.00/ 95.00	110.00/120.00	120.00/ —
100% Kraft Corr. Cuts	125.00/140.00	110.00/120.00	125.00/135.00	135.00/ —
Used Kraft Bags	85.00/ 95.00	60.00/ 70.00	85.00/ 95.00	65.00/ —
No. 1 Brown Kraft Paper	90.00/ 95.00	70.00/ 80.00	85.00/100.00	65.00/ —
Super Resorted Br. Kraft	100.00/105.00	85.00/ 95.00	95.00/105.00	90.00/ —
New Br. Kraft Env. Cuts	160.00/175.00	130.00/135.00	160.00/175.00	150.00/ —
New Br. Kraft Cuts	150.00/180.00	125.00/ —	140.00/160.00	140.00/ —
No. 1 Gdwd Shvs.	80.00/ 85.00	75.00/ 80.00	85.00/ —	75.00/ —
White Newsblanks	110.00/120.00	105.00/110.00	110.00/125.00	115.00/ —
No. 1 Flyleaf Shvs.	80.00/ 85.00	90.00/ 95.00	95.00/105.00	110.00/ —
No. 1 Soft Wht. Shvs.	175.00/190.00	170.00/175.00	175.00/195.00	175.00/ —
Super Soft Wht. Shvs.	190.00/200.00	180.00/ —	185.00/200.00	190.00/ —
Hd. Wht. Shvs.	185.00/205.00	185.00/195.00	190.00/200.00	190.00/ —
Hd. Wht. Env. Cuts	200.00/215.00	195.00/210.00	200.00/220.00	190.00/ —
New Manila Env. Cuts	140.00/150.00	125.00/ —	140.00/150.00	115.00/ —
Col. Tab Cards	90.00/105.00	100.00/110.00	95.00/120.00	100.00/ —
Manila Tab Cards	150.00/170.00	160.00/170.00	160.00/180.00	165.00/ —
No. 1 Mixed Ledger	95.00/100.00	85.00/ 90.00	90.00/100.00	100.00/ —
White Ledger	125.00/135.00	110.00/115.00	115.00/125.00	125.00/ —
No. 1 Book & Mag.†	45.00/ 50.00	30.00/ 35.00	40.00/ 50.00	35.00/ —
No. 1 Rep'd. Hvy. Books‡	35.00/ 65.00	50.00/ —	45.00/ 50.00	55.00/ —

* Delivered. † Includes Time & Life; no coarse groundwood. ‡ Not to exceed 10% groundwood.

RAG MARKET

New Domestic Cotton Cuttings
(Prices to Dealers, F.o.b. Ship. Pt.)
ALL PRICES NOMINAL

No. 1 White Shirts	$19.00/$20.00
No. 1 Unbichd. Muslins	19.00/ 20.00
Bichd. Canton Flannels	16.00/ 17.50
No. 1 Lt. Silesias	12.00/ 13.00
No. 1 Lt. Prints	9.00/ 10.00
Wht. Bk. Blue Overalls (Bichable)	13.00/ 13.50
No. 1 Blue Overalls	7.00/ 9.00
Fancy Shirts	6.00/ 6.50
No. 1 Washables	5.00/ 5.50
Suntan Khaki Cuts	9.00/ —
Mixed Khaki Cuts	7.00/ 8.00
Corduroy Cuts	4.75/ 5.25
Cottonades	4.50/ 5.00
Bichd. Underwear Cuts	20.00/ 21.00
Unbichd. Underwear Cuts	19.00/ 20.00

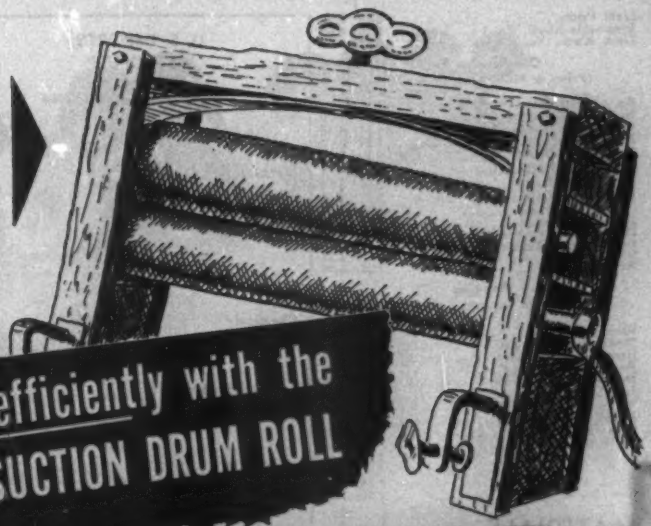
Old Domestic Cotton Rags
(Prices to Dealers, F.o.b. Ship. Pt.)
ALL PRICES NOMINAL

	Per 100 lbs.
Mixed White	$4.50/$5.00
Cotton Pants & Overalls	3.75/ 4.25
Thirds and Blues, Repacked	3.50/ 3.75
No. 1 Roofing Rags	2.40/ 2.50
No. 2 Roofing Rags	2.30/ 2.40
No. 3 & 4 Roofing Rags	2.20/ 2.30
Roofing Bagging	2.20/ 2.30

New Foreign Cotton Cuttings
(Prices to Mills, F.o.b. Dock, N.Y.)

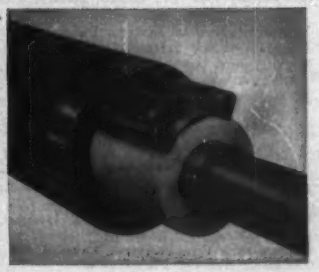
	Per 100 lbs.
New Dark Cuttings	$4.25/$4.75
New Mixed Cuttings	4.50/ 5.00
Light Silesias	7.50/ 8.00
Light Flannelettes	7.50/ 8.00
New White Cuttings	nominal
New Unbleached Cuttings	nominal
Fancy Shirt Cuttings	6.00/ 7.00

Here's the way some mills still do it!

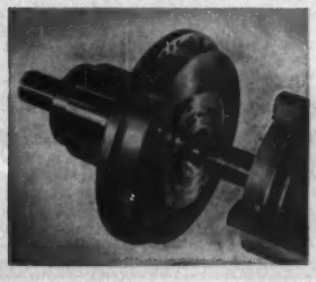


BUT MODERN MILLS

remove water efficiently with the MANCHESTER SUCTION DRUM ROLL



Balanced design at its best. Note these features: Box and shell built concentrically; box can be pulled in running position; smooth, even contact of packing against inner shell bore; pressure of packing against inner shell bore *always* at right angles to centerline of box and shell; durable stainless featherweight packing springs, stainless steel studs and nuts.



Here you can see how the *grease stays in and water stays out.* The forged steel heads have bearings positively sealed against moisture. With this rugged construction you get highest efficiency and insurance against down-time and production losses in your mill.

YOU TOO CAN HAVE THESE

BIG 7 ADVANTAGES

1. Bigger Profits
2. Better-Quality Paper
3. Quicker Buyer Acceptance of Your Products
4. Longer Felt Life
5. Cleaner Felts
6. Faster Drying Rate
7. Increased Production

Write today for complete information and quotation on your requirements.

THE MANCHESTER MACHINE COMPANY

1710 CENTRAL AVENUE • MIDDLETOWN, OHIO

SPECIALISTS IN PAPER MILL MACHINERY AND COMPLETE REPAIR SERVICE

Light Prints	6.00/ 7.00
Bleachable Khaki, No. 1	5.50/ 6.00
Unbl. Khaki, No. 1	4.50/ 5.00

Old Foreign Rags

(Prices to Mills, F.o.b. Dock, N. Y.)

	Per 100 lbs.
No. 1 White Cottons	$6.50/$7.50
No. 2 White Cottons	5.50/ 6.00
No. 3 White Cottons	4.00/ 4.50
No. 4 White Cottons	3.50/ 3.75
Extra Light Prints	4.50/ 5.00
Old Light Prints	4.00/ 4.25
Med. Light Prints	3.50/ 3.75
Dutch Blue Cottons	3.75/ 4.00
Checks and Blue	3.00/ 3.50
Linsey Garments	2.75/ 3.00
Dark Cottons, European	2.25/ 2.50
Dark Cottons, Egyptian	2.15/ 2.30
Old Shopperies	2.10/ 2.25
New Shopperies	2.25/ 2.50

Bagging

(Prices to Dealers, f.o.b. N. Y.)

	Per 100 lbs.
Foreign Gunny	$7.00/$8.00
Domestic Gunny, No. 1	6.75/ 7.25
Heavy Wool Tares	6.75/ 7.50
Foreign Manila Rope	4.25/ 4.50
Domestic Manila Rope	5.75/ 6.50
Jute Strings	6.25/ 6.50
No. 1 Sisal Strings	4.50/ 5.50
Mixed Strings	nominal
Paper Mill Tares	3.25/ 3.75
No. 1 Scrap Burlap	
Foreign	5.00/ 6.50
Domestic	6.00/ 7.00
Austr. Wool Pouches	7.50/ 8.00
New Burlap Cuttings	7.00/ 7.50

MATERIALS

Aluminum, sulfate:
- coml. bags, wks. ..... cwt. 1.65
- iron-free c.l. 3.25

Alcohol, ethyl:
- tax free, dnts. c.l. ..... gal. .77 / 1.02
- dnld. East Miss.

Alcohol, methyl:
- Synthetic, Zone 1, dnts.
- c.l. fit. alld. ..... gal. .44

Casein, acid-prec.:
- dom. sh. pt. c.l. ..... lb. .39 / .43½
- imp. ex dock ..... lb. .39½/ .40¼

Caustic soda:
- c.l. wks. solid, 76%, cwt. 3.35
- flak. & grd. 100-lb. drums ... 3.75
- liquid 50% tanks 2.55
- liquid 70% tanks 2.65

China clay:
- dom. air-float. filler, c.l. wks. ton 10.00
- water-washed, lump, filler 11.00
- coating ..... 17.60 /30.50
- imported, ex whse. ..short ton 15.20 /28.35

Chlorine:
- single-unit tanks, works .. cwt. 2.70
- multi-unit ..... cwt. 3.20 / 4.40

Formaldehyde:
- USP, ink. dnts, c.l. wks. .... lb. .0600/ .0625
- l.c.l. E. wks. ..... .0650/ .0675

Fuel oil:
- Bunker C, No. 6 Cal. hvy
- tanks, refinery ..... bbl. 1.95 / 2.15
- light ..... bbl. 2.05 / 2.10

Hydrogen peroxide:
- USP, 35% chys. E. of Miss. lb. .34½/ .35½

Lime:
- hydrated, bags, wks. Buffalo ton 13.50

Rosin:
- B gum, drms, c.l. Savan. .. cwt. 8.00
- G, H, I ..... cwt. 8.13
- K ..... cwt. 8.50
- FF, wood, do. ..... cwt. 7.30

Rosin size:
- 70%, gum & pale grds, tank cars, south, sh. pt. .... cwt. 6.80 / 7.00

Salt cake:
- dom. bulk, c.l. wks. ..... ton 17.00
- wks. frt. all. ..... ton 20.00 /22.00

Soda ash:
- light, 58%, bags, wks. 1.50
- bulk ..... cwt. 1.20

Sodium silicate 40°:
- turbid, c.l. wks. ..... cwt. 1.20
- l.c.l. wks. ..... 1.55 / 1.95

Sodium peroxide:
- dnts. c.l. E. of Miss. ..... lb. .19
- l.c.l. do. ..... lb. .19½/ .20

U. S. IMPORTS
WOODPULP

Preliminary, November, 1950

Item	Country of Origin	Short Tons
Mechanical		
Unbichd.	Canada	15,012
	Norway	219
	Finland	1,259
		16,490
Screenings	Canada	392
Bichd.	Canada**	3,521
Chemical		
Sulfite, Unbichd.	Canada	38,461
	Sweden	2,919
	Norway	448
	France**	51
	Germany	207
	Austria	753
	Czechoslovakia	428
	Finland	2,056
		45,327
Screenings	Canada	445
Sulfite, Bichd. Rayon & Special Chem. Grades	Canada	18,995
	Sweden	156
	Norway	*
	Italy**	167
		19,318
Other	Canada	24,140
	Sweden	1,693
	Norway	673
	Austria	895
	Czechoslovakia	112
	Finland	1,559
		29,072
Sulfate, Unbichd.	Canada	15,760
	Sweden	5,169
	Austria**	22
	Finland	5,298
		26,249
Sulfate, Bichd.	Canada	28,878
	Sweden	3,915
	Norway	56
		32,489
Soda, Unbichd. & Bichd.	Canada	2,895
Totals, November	Canada	148,499
	Norway	1,396
	Finland	10,172
	Sweden	13,852
	France	55
	Germany	207
	Austria	1,670
	Czechoslovakia	540
	Italy	167
		176,558

* Less than 1,000 tons.
** To be investigated by Census.

Soybean, protein:
- chem. isol, wks. c.l. ..... lb. .24 / —
- Cinn. and Chic.

Sulfuric acid:
- 60° Be. chys. c.l. wks. .... cwt. 1.75 / —
- l.c.l. wks. ..... cwt. 2.05 / 2.60

Sulfur:
- crude, c.l. mines, contract, long ton 21.00 /22.00
- f.o.b vessels Gulf ..... 22.50 /23.50
- Export, f.o.b. Gulf 25.00

Sulfur dioxide:
- liquid, coml. cyl. wks. ..... lb. .09
- multi-unit cars ..... lb. .0535

Starches:
- pearl corn, bags, c.l. Chic. .. cwt. 5.72 / —
- white dextrines, c.l. Chic. .. cwt. 7.09 / —
- potato, Idaho, c.l. wks. .... cwt. 5.50 / —
- potato, Maine, c.l. wks. .... cwt. 5.25 / —
- tapioca, conv. dextrines ... cwt. 7.50 / 8.00
- medium grds. Gulf and East Coast ports ..... 6.75 / 7.50
- low, Siam, on dock N. Y. ..... 5.00 / 5.50 nominal

Talc:
- domestic, 50-lb. sacks, c.l. wks. ..... ton 25.00 /30.00

Titanium dioxide:
- anastase, c.l. dnld., bags .... lb. .21 / .21½
- l.c.l. dnld. ..... lb. .22 / .22½
- rutile, c.l. dnld. ..... lb. .23 / .23½
- l.c.l. dnld. ..... lb. .24 / .24½

N.B.: For special market conditions, see *Trends*.

IMPORTS

IMPORTS AT NEW YORK

Newsprint

Week Ending Dec. 30

N. Y. Daily Mirror, Mabella, Botwood, 172 rolls.

N. Y. Journal American, Mabella, Botwood, 1069 rolls.

N. Y. Times, Mabella, Botwood, 1038 rolls.

Montmorency Paper Co., Mabella, Botwood, 2046 rolls.

News Syndicate Co., Montalta, Dalhousie, 8676 rolls.

N. Y. Journal American, Markland, Liverpool, N.S., 347 rolls.

N. Y. Daily Mirror, Markland, Liverpool, N.S., 118 rolls.

N. Y. Herald Tribune, Markland, Liverpool, N.S., 2081 rolls.

N. Y. World Telegram, Markland, Liverpool, N.S., 349 rolls.

Buffalo Color Press, Markland, Liverpool, N.S., 624 rolls.

Brooklyn Daily Eagle, Inc., Markland, Liverpool, N.S., 149 rolls.

Brooklyn Eagle Press, Markland, Liverpool, N.S., 46 rolls.

Herald Statesman, Inc., Markland, Liverpool, N.S., 42 rolls.

N. Y. Times, Markland, Liverpool, N.S., 410 rolls.

Advance Pattern Co., Markland, Liverpool, N.S., 29 rolls.

Trade Union Service, Inc., Markland, Liverpool, N.S., 120 rolls.

W. D. Peck, Inc., Markland, Liverpool, N.S., 145 rolls.

Richmond Newspapers, (Richmond, Va.), Markland, Liverpool, N.S., 1778 rolls.

Pepper Printing Co., (Richmond, Va.), Markland, Liverpool, N.S., 69 rolls.

Photo Paper

J. J. Gavin Co., Queen Mary, Southampton, 10 cs. (unsensitized).

Alco Photo Supply Corp., Queen Mary, Southampton, 28 cs. (sensitized).

they work slow

so that you may work fast...

The fabric upon which these women are working has just been removed from the loom on which it was woven in a single strip. They are converting it into an endless belt, weaving the ends together by hand. Their workmanship is so perfect that the keenest examination will be unable to discover where the loom left off and hand weaving began.

This patient, precise, time-consuming method of working is characteristic of every operation in the manufacture of Hamilton Felts, from the selection of the wools to the shrinking, fulling and finishing. It is a *tradition,* handed down through four generations. It explains why Hamilton Felts run true at all speeds of paper and board machines—why they remove more water—why they leave no felt marks on either side of the sheets.

SHULER & BENNINGHOFEN, HAMILTON, OHIO

Miami Woolen Mills

Hamilton Felts

Established 1858

Wallpaper

C. R. Gracie & Son, Cape York, Taku Bar, 12 cs.
Intermaritime Forwarding Co., Media, Liverpool, 329 ctns.
C. A. Haynes & Co., Media, Liverpool, 228 ctns.
C. A. Haynes & Co., American Packer, Liverpool, 56 bls., 8 pkgs.

Writing Paper

All Transport, Inc., American Clipper, Havre, 1 cs.

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Process Studies, Design, Specifications and Engineering Supervision
PULP AND PAPER MILLS
Steam, Hydraulic and Electrical Engineering Reports, Consultation and Valuations
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POSITIVE
Reg. U. S. Pat. Off.
High Speed Disc Refiner
THE BAHR BROTHERS MFG. CO.
MARION, INDIANA, U.S.A.

CERTIFIED PULP TESTERS available on the desk or at the mill — Paper Packaging Problems
Paper and Pulp Testing Laboratories
118 East 28 Street
New York 16, N. Y.
Murray Hill 3-9761
QUALITY CONTROL TESTS for Paper Mill, Paper Converter, Paper Dealer
WILLIAM LANDES B.S. Pulp and Paper N. Y. S. College of Forestry Syracuse, N. Y.
TAPPI STANDARDS USED IN ALL TESTS

FIBER RESEARCH AND SERVICE
Semi-Chem. and Chemical Pulp Processes
Pilot Plant Facilities
THE KINSLEY CHEMICAL COMPANY
Cleveland 11, Ohio

THE H. K. FERGUSON COMPANY
PAPER MILL ENGINEERS & BUILDERS
Complete Service for Design, Construction, Equipment, Installation, Engineering Reports and Surveys
Executive Offices
Domestic Engineering Connections
District Offices

Beryta Coated Paper

Lep Transport, Inc., American Leader, London, 52 rolls; 56 rolls (raw base).
Stevens Nelson Paper Corp., American Leader, London, 3 cs.
D. W. Hickey, American Leader, London, 94 rolls.

Wrapping Paper

J. P. Heffernan Paper Co., Pres. Polk, Genoa, 110 bls.

Drawing Paper

H. Reeve Angel & Co., Inc., American Leader, London, 2 cs.

Filter Paper

H. Reeve Angel & Co., Inc., American Leader, London, 14 cs.

Cigarette Paper

P. Lorillard Co., De Grasse, Havre, 150 cs.

Crepe Paper

Brundage Merchandise Co., American Counselor, Rotterdam, 27 cs.
Brundage Merchandise Co., Noordam, Rotterdam, 24 cs.

Printing Paper

Mercury Paper Co., American Counselor, Rotterdam, 1 cs.
F. C. Strype, Noordam, Rotterdam, 11 cs.
E. de Vries Co., Noordam, Rotterdam, 3 cs.

Gummed Paper

B. F. Drakenfeld & Co., Media, Liverpool, 46 cs.
B. F. Drakenfeld & Co., American Packer, Liverpool, 94 cs.

Fancy Paper

Stevens Nelson Paper Corp., Merchant Royal, Bombay, 2 bls.

Rags, Baggings, etc.

National City Bank, Pres. Polk, Bombay, 100 bls. jute rags.
E. J. Keller Co., Inc., Eugenio C., Genoa, 60 bls. bagging, 35 bls. light bagging, 77 bls. heavy burlap bagging.
National City Bank, Pioneer Glen, Melbourne, 13 bls. rags.
A. de Vries Trading Corp., Villanger, Antwerp, 102 bls. scrap bagging.
Midwest Waste Materials Co., Villanger, Rotterdam, 57 bls. paperstock.
E. J. Lang, Villanger, Rotterdam, 112 bls. tares.
A. de Swaan, Villanger, Rotterdam, 768 pkgs. bagging.
E. J. Keller Co., Inc., Villanger, Rotterdam, 95 bls. cotton cuttings.
National City Bank, Villanger, Rotterdam, 99 bls. paperstock.
D. Benedetto, Villanger, Rotterdam, 85 bls. rags.
Castle & Overton, Inc., American Leader, London, 281 bls. waste paper.
(———), American Leader, London, 120 bls. old bagging.
National City Bank, American Leader, London, 125 bls. jute bagging, 51 bls. rags.
Robbins Forwarding Co., American Leader, London, 24 bls. rags.
National City Bank, Exbrook, Piraeus, 147 bls. rags.
Sadlor Trading Corp., Media, Liverpool, 37 bls. jute waste.
A. Siegle Corp., Media, Liverpool, 77 bls. jute waste.
(———), American Packer, Manchester, 29 bls. new cuttings, 37 bls. bagging.
Chase National Bank, American Packer, Manchester, 49 bls. old bagging.
Sadlor Trading Corp., American Packer, Manchester, 248 bls. jute waste.
A. Siegle Corp., American Packer, Manchester, 770 bls. jute waste.
Railway Supply & Manufacturing Co., American Packer, Manchester, 56 bls. bagging.
Darmstadt Scott & Courtney, American Packer, Manchester, 32 bls. rags.
E. J. Lang, American Packer, Liverpool, 60 bls. old bagging.

Old Rope

(———), American Leader, London, 56 coils.

Woodpulp

Price & Pierce, Ltd., Markland, Liverpool, N.S., 941 bls. unbleached sulphite pulp.

Casein

Crawford & Co., Mormacsaga, Buenos Aires, 700 bags (lactic).
Bank of The Manhattan Co., Pioneer Glen, Melbourne, 800 bags (rennet).
(———), Pioneer Glen, Melbourne, 1000 bags (rennet).
J. H. Schroeder Banking Corp., Pioneer Glen, Sydney, 200 bags (lactic).
National City Bank, De Grasse, Havre, 528 bags.

IMPORTS AT BOSTON

Week Ending Dec. 30

Irving Trust Co., American Clipper, Havre, 82 bls. bagging.
(———), American Leader, London, 144 bls. old bagging.
International Purchasing Co., American Leader, London, 144 bls. old rope.
Elliott Addressing Machine Co., Sakura, Kobe, 32 cs. tengujo paper.
E. Butterworth & Co. Inc., American Packer, Manchester, 72 bls. old bagging.
H. G. Lichtenstein, American Packer, Manchester, 44 bls. new cuttings.
J. T. Flannery, American Packer, Liverpool, 47 bls. paperstock.

IMPORTS AT PHILADELPHIA

Week Ending Dec. 30

Castel & Overton, Inc., Villanger, Antwerp, 43 bls. new cuttings.
Philadelphia National Bank, Villanger, Antwerp, 72 bls. jute waste.
(———), Villanger, Rotterdam, 90 bls. cotton shoddies.
Manufacturers Trust Co., Villanger, Rotterdam, 166 bls. rags.
Wallworth Co., Villanger, Rotterdam, 37 bls. jute waste, 199 bls. jute thread waste.
Castle & Overton, Inc., Villanger, Rotterdam, 58 bls. rags.
J. T. Flannery, American Leader, London, 70 bls. paperstock.
Riegel Paper Corp., American Packer, Manchester, 40 bls. bagging.
E. J. Lang, American Packer, Manchester, 58 bls. old bagging.
New England Waste Co., American Packer, Manchester, 52 bls. jute waste.

IMPORTS AT NORFOLK

Week Ending Dec. 30

A. de Vries Trading Corp., Villanger, Antwerp, 106 bls. scrap bagging.
E. J. Keller Co. Inc., Villanger, Antwerp, 119 bls. scrap bagging.
(———), American Packer, Manchester, 38 bls. bagging.
E. Butterworth & Co. Inc., American Packer, Manchester, 110 bls. old bagging.

IMPORTS AT BALTIMORE

Week Ending Dec. 30

S. Shapiro & Sons, Villanger, Rotterdam, 204 bls. cotton rags.
Gotteeman & Co., Inc., S. S. Paraguay, Iggesund, 617 bls. blchd. sulfite, 882 bls. blched. kraft, 925 bls. semiblchd. kraft; Svano, 5,734 bls. unblchd. sulfite.

OHIO TAPPI MEETING

(Continued from page 31)

able to have too many of No. 4 because of the resultant stiffness and brittleness of such a sheet. Hydrogen bonds are created mainly through fibrillation of the paper pulps during refining.

Other materials such as rubber and resins can be used with cellulose to give wet strength with the necessary stretch and elongation. To get this effect chemical groups are employed which give hydrogen bonding with the hydroxyl groups of cellulose. To gain flexibility it is desirable to use groups which have sizes in the order of 5 to 7 Angstrom units; since close distances such as one gets with other linkages cause the strains which make for brittleness.

Groups giving good stretch and elongation consist of carbonyl and cyana groups both of which form hydrogen bonds with cellulose.

Dr. Mark illustrated the morphology of cellulose with some very interesting slides made from photomicrographs from the electron microscope. Those slides illustrated the matted fibrils present in the primary cell wall of cellulose fibers from spruce, flax and hemp. Slides were also shown illustrating the types of structures found in the secondary cell wall; it was pointed out that the primary wall must be ruptured in pulp refining if extrusion of the secondary wall fibrils is to give any fiber to fiber bonding. It was pointed out by Dr. Mark that fibril structure may be a most important feature of fiber to fiber bonding.

Following Dr. Mark's lecture the Tappi men showed their lively interest in this subject of fiber to fiber bonding by the numerous questions asked of Dr. Mark. Some of these questions are answered briefly below:

1. Q—What range of distances is required for optical contact?

A—Optical contact is secured with distances in the order of one micron. These distances are thus rather large.

2. Q—Is there a basis for the attributed spiral structure of primary and secondary cell walls?

A—Yes, in some cases, as in cotton. Fibers from various species differ much in their structure, and also differ according to their age of development.

3. Q—Why don't fibers bond after they are suspended in acetone or other solvents?

A—Water is a small molecule, and on elimination of water the fiber to fiber distances are close enough to give hydrogen bonding. Acetone on the other hand is a larger molecule and can be removed from the fiber at a much lower temperature. Fibers soaked in acetone are farther apart, and when the acetone is removed no hydrogen bonding is formed.

4. Q—Can the ether linkages be proved to exist in parchmentized paper?

A—Yes, because these papers will not dissolve in normal cellulose solvents.

5. Q—Would carboxyl methyl cellulose give increased bonding?

A—Yes, carboxyl methyl cellulose gives carboxyl groups which are apart from the chain. They can thus bond and nest with cellulose.

6. Q—Has the thio linkage been used in cellulose?

A—The cellulose xanthate group can be insolubilized if oxidized.

7. Q—Would the thio bond be rigid or flexible?

A—Yes, the thio bond would be a desirable flexible bond except for the fact that it is not too stable to heat.

8. Q—If acetone cannot penetrate sufficiently is it a matter of dielectrical strength?

A—Yes.

9. Q—In wet strength papers are the bonds of an ether linkage type?

A—We know that alkaline washing of wet strength papers loosens the bonds; so they are not all real chemical linkages.

10. Q—Is the easy bonding of purified hardened semichemical pulp due to the increased number of hydroxyl groups present in the hemicellulose groups?

A—Yes, in general this probably is true.

11. Q—How thick is the primary cell wall?

A—About 1/10 of a micron.

12. Q—What is the chemical construction of the primary cell wall?

A—This matter of chemical construction has not been fully solved but is regarded to be cellulose with hemicellulose deposited both outside and inside the cell wall and with lignin deposited also on the outside.

PPTA RECEPTION & DINNER

The Philadelphia Paper Trade Assn.'s annual reception and dinner will be held January 10 at the Warwick Hotel.

T. H. Butler Smythe, president of the J. L. N. Smythe Co. and president of the Paper Trade Assn. of Philadelphia, has announced the appointment of a special dinner committee for the seventh annual dinner and reception, commemorating the 47th anniversary of the association.

Dinner committee members are as follows: Chairman, Henry L. Adler, president, Huff Paper Co.; Harold Isen, president, Enterprise Paper Co.; Allen M. Russell, president, Molten Paper Co.; W. Brels Killhour, president, W. B. Killhour & Sons; Nevill Smythe, J. L. N. Smythe Co.

The board of governors has issued invitations to the representatives of the various paper mills and supply firms, who do business with the Philadelphia paper merchants. This is an annual custom and the unusual feature of this occasion is that the association members as a whole extend invitations to their mutual friends who are mill executives in the paper industry.

The association has had very successful dinners in the past several years and the attendance last year was over 300 men.

The annual meeting of the entire membership, which consists of the Fine and Wrapping Paper Divisions, will be held this year at noon on the same day, January 10, 1951, for the election of officers for the ensuing year.

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PASSAIC, NEW JERSEY

AMERICAN PAPER AND PULP ASSOCIATION'S PAPER PRODUCTION RATIO REPORT

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

	Nov. 25	Dec. 2	Dec. 9	Dec. 16	Dec. 23*
1950	102.4	104.1	106.8	106.1r	103.3
	Nov. 26	**Dec. 3**	**Dec. 10**	**Dec. 17**	**Dec. 24**
1949	*94.5*	*99.5*	*99.9*	*98.7*	*87.9*

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1949	*94.6*	*92.8*	*89.1*	*85.1*	*82.7*	*78.6*	*72.8*	*87.6*	*89.7*	*96.0*	*98.2*	*89.8*	*88.0*
1950	97.6	100.8	101.9	100.5	100.8‡	103.2‡	90.8‡	105.8‡	101.7‡	106.7‡	105.8‡		

* Weekly capacity base increased by 8 tons.
r Revised.
‡ Preliminary.

COMPARATIVE YEARLY SUMMARIES

	1943	1944	1945	1946	1947	1948	1949	1950
Year to Date	87.8	88.1	89.7	101.4	104.9	96.7	88.9	102.1
Year Average	87.8	88.1	89.4	100.1	104.3	96.2	88.0	

PAPERBOARD OPERATING RATIOS†

	Nov. 25	Dec. 2	Dec. 9	Dec. 16	Dec. 23
1950	100	101	106	105	105
	Nov. 26	**Dec. 3**	**Dec. 10**	**Dec. 17**	**Dec. 24**
1949	*90*	*93*	*96*	*92*	*92*

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1949	*88*	*85*	*79*	*79*	*78*	*75*	*64*	*85*	*87*	*94*	*93*	*83*	*83*
1950	88	92	91	92	91	94	82	100	96	102	101		

All of the above data is based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.

N.C.S.I. PROGRAM

The following is a tentative program for the annual meeting of The National Council for Stream Improvement, Inc., to be held at the Waldorf-Astoria, New York, N. Y., February 19 to 22:

Monday, 10:00 a.m.
The Joint Meeting of Operating Committee and Regional Chairmen
Tuesday, 10:00 a.m.
Staff Meetings
Wednesday, 10:00 a.m.
Annual Meeting of Board of Governors
Wednesday, 2:00 p.m.
Annual Meeting of Members
Thursday, 10:00 a.m
Research Review and Open Panel Discussion

All members are urged to make immediate plans for attending the annual meeting of members on Wednesday afternoon, February 21, as at this meeting a number of decisions on matters of paramount importance to the members will be required.

Regulatory agency representatives, representatives of research and other institutions, and others interested in stream improvement problems in general are cordially invited to attend the annual meeting of members on February 21 and the research review and open panel discussion on February 22.

A speaker of national prominence in the stream pollution control field will speak at the annual meeting of members. At the research review, papers on pulp and paper industry stream pollution problems will be presented by highly qualified experts in the field and will be discussed individually by outstanding authorities in the stream sanitation field.

SUPTS. TO HEAR WILLIAMSON

Harry Williamson, well-known papermaker and consultant, is to address the Connecticut Valley Division of the Superintendents Assn. on January 26, at a stag dinner meeting to be held at the Roger Smith hotel, Holyoke, Mass. The dinner meeting is to be called at 7:00 p.m.

The subject of Mr. Williamson's talk will be "The Beating and Hydration of Rag and Pulp Stock." This talk is reported to be of equal interest to both cylinder and Fourdrinier superintendents.

Alfred Montagna, Southworth Co., West Springfield, Mass., is chairman of the Connecticut Valley Division.

SPRING MEETING DATES

G. T. Renegar, Container Corp. of America, Manayunk, Pa., has announced that the Pennsylvania–New Jersey–Delaware Division of The American Pulp and Paper Mill Superintendents Assn. will hold its 1951 Spring meeting on May 11-12, at Hotel Easton, Easton, Pa. Mr. Renegar requests that all reservations for rooms at Hotel Easton be made direct with the hotel.

Working on the program with Mr. Renegar, as chairman of the Division, are the following: Walter B. Morehouse, Affiliates; Alan Boyd, Breakfast Club; Albert Hartley, Golf; Elmer Mitchell and Andrew J. Luettgen, Program; J. J. Bidwell, Jr., and James Traill, Banquet and Entertainment; Joseph Paciello, Publicity; Howard Street, Hospitality, and Mrs. G. T. Renegar, Ladies Activities.

EMPIRE STATE MEETING

GLENS FALLS, N. Y. — Benjamin R. Newcomb and Charles A. Dickhaut, of the John Waldron Corp., New Brunswick, N. J., were the principal speakers at a meeting of the Empire State Section of the Technical Assn. of the Pulp and Paper Industry held on December 14. Messrs. Newcomb and Dickhaut are co-inventors of the microjet coater, an air blade type that has come into extensive use, and the syncroset coater, a printer type of coater used in machine coating.

M. I. T. ANNUAL LUNCHEON

On February 21, at 12:00 noon, the Massachusetts Institute of Technology Alumni will have their annual luncheon in connection with the TAPPI convention. John B. Calkin is chairman of this year's luncheon which will again be held at the Engineers Club, 32 West 40th street, New York City. Reservations may be made through D. F. Lowry, c/o Penick & Ford, Ltd., Inc., 420 Lexington avenue, New York 17, N. Y.

OHIO SECTION TO MEET

The next meeting of the Ohio Section of TAPPI will be held on February 8 and will be a discussion of quality control led by two speakers from the Scott Paper Co. This will be a joint meeting with the Cincinnati Club of Printing House Craftsmen and for this reason will be held at the Hotel Sheraton Arms in Cincinnati instead of the usual meeting place for the Ohio Section of TAPPI. Dinner will be served at 6:30 p.m. and the discussion will follow the dinner.

CRUDE TALL OIL FOR GERMANY

WASHINGTON, D. C.—Because of exchange difficulties, German users have turned increasingly to importation of crude tall oil, instead of the refined product, especially from American sources, says an American official source.

Increased consumption has followed the German construction program, it is reported, especially in recent months, so that the market has not been able to keep up with demand.

JUTE IMPORTS DOUBLE

WASHINGTON, D. C. — Jute and jute butts imports rose to 9,489 tons, valued at $3 million in October, from the September importation of 4,853 tons, valued at $1,500,000, according to latest Commerce Department figures.

CLEARING HOUSE

HELP WANTED

MEN WANTED
POSITIONS OPEN

We can place—managers, day and night superintendents and asst. supts. for mills making box board, chip and jute liners, bond, blueprint, ledger, offset, rag, sulphite, blotting, cover and specialty papers, also roofing felt; supts. and foremen for paper converting plants.

Master Mechanics, designers engineers and draftsmen for mills and for companies building paper mill machinery; mill engineer or consulting engineer for group of mills; chemists and chemical engineers for mills and paper converting plants; methods engineer, time studies, etc.; industrial engineers.

Office Manager; personnel trainee, salesmen to sell mill machinery, chemicals, gums, waxes, etc.; Cylinder and Fourdrinier machine foremen; beater engineers; machine tenders and back tenders; board machine tender for foreign country $500 a month, room, board and transportation furnished.

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We will keep you informed of attractive positions open in the pulp and paper mills.

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SPECIALISTS IN PLACING PULP AND PAPER MILL EXECUTIVES J-5

"A position will be open in the near future for a first class super calender operator in a west coast paper mill. Must have sufficient experience to be capable of handling job and training others. In reply give full details, including references. Reply Box 51-8 C/O Paper Trade Journal." J-12

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards in individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. BIXBY, INC. —117 Dun Bldg., Buffalo, 2, N. Y. TF

Chemist—with paper coatings experience wanted by lithographic industry in Midwest, for quality control in laboratory and mill. Send complete resume. Address Box 50-620 care Paper Trade Journal. J-12

J-12

PRODUCTION CHIEF

Paper converting, nationally known. Printing, coating, gumming, laminating, finishing operations. Lifetime position for top-flight production executive. Our people know of this ad. Send full details confidentially to President, Box 50-443, care Paper Trade Journal. TF

HELP WANTED

WANTED

Night Superintendent to take full charge of two-machine Mill making Sulphite and Rag Content Papers. Must be experienced, aggressive, honest, and dependable. In application, state complete details and references. Excellent opportunity for an ambitious man. Write Box No. 50-625 care Paper Trade Journal J-19

WORKING SUPERINTENDENT for small, fast growing Eastern mill making lightweight specialties. Cylinder machine experience essential. State qualifications and salary expected. Address Box 50-376 care Paper Trade Journal. TF

TOUR BOSS wanted for Board Mill in East. Must have experience on folding grades. Address Box 50-473 care Paper Trade Journal. TF

WANTED — SALES ENGINEER — Experienced in Pulp and Paper Mills, for sales and service work. Excellent opportunity with old established machinery manufacturer. In reply, give resume of education, experience and current salary. Address Box 50-513 care Paper Trade Journal. TF

ENGINEERING DRAFTSMEN (2), under thirty, some experience in pulp and paper industry, for large mill in South. Submit resume to Box 50-623 care Paper Trade Journal. J-12

CHEMICAL ENGINEER to fill position of Assistant Quality Control Supervisor in large fiber insulation board manufacturing plant, located in South. All replies confidential. Our personnel know of this ad. Address Box 50-621 care Paper Trade Journal. J-19

WANTED—MASTER MECHANIC for one machine mill making Folding Grades. Good salary and good working conditions. Contact R. E. STEARNS, Empire Box Corp., of Stroudsburg, P. O. Box 54, Stroudsburg, Pennsylvania. J-12

WORKING SUPERINTENDENT for small napkin converting plant. Knowledge of printing essential. State salary, experience, etc. Address Box 51-4 care Paper Trade Journal. J-26

WANTED—Machinist-millwright with knowledge of electricity for paper mill under construction in Eastern Pennsylvania. Position permanent. Salary commensurate with ability and past experience. Write fully Box 51-2 care Paper Trade Journal. J-5

WANTED: DESIGN AND PROJECT ENGINEER—California, 3 to 15 years experience and engineering degree. Experience in insulations, floorcoverings, roofings, building materials and paper mills preferred. Competitive salary depending upon individual qualifications. Address Box 51-11 care Paper Trade Journal. J-19

WANTED—Paper Mill Superintendent for cylinder tissue mill making colored Twisting Tissue. Must be a practical man with knowledge of color matching and general mill maintenance. New York State location. Address Box 50-612 care Paper Trade Journal. J-5

SITUATIONS WANTED

FELT SUPERINTENDENT—27 years experience in operating and setting up Felt Mills. Know the latest and less costly system to use. Will be glad to meet you and talk it over. Address Box 50-619 care Paper Trade Journal. J-5

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32" Cameron model 24-3A Slitter.
48" Kidder model CH shear cut Slitter.
32" Hubbs Box Slitter.
44" Dusk Shooter with 10-roll back-stand and layboy.
28" Hamblet Shooter.
32" Finley Shooter.
100" Herm single-knife Shooter.
68" Oswego mill type Power Cutter.
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36 x 48 Kidder one-color Rotary.
3-color Cottrell 21½ Sag Press.
Model D Cleveland Folder with continuous feeder.
Edmonton Delivery for 4-8 or 5-8 Models.
No. 3 Smyth Book Sewer.
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J-5

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Box 51-5, C/O Paper Trade Journal

J-11

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FOR SALE

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AC MOTORS (3 ph. 60 cy.)

HP	Make	Wdg	Spd.	Type
300	G.E.	S.C.	450	MT
250	G.E.	S.C.	450	LM
200	G.E.	S.C.	450	LM
200	Al.Ch.	Syn.	600	
150	G.E.	S.C.	450	
150	G.E.	S.C.	600	IK
150	West.	Syn.	1800	AYI
150	Westgh.	Syn.	1800	3 Ph.
100	West.	S.C.	900	CS
100	West.	S.C.	1200	
100	West.	Syn.	2277	
100	G.E.	S.C.	450	LM
100	Al.Ch.	S.C.	720	ARX
100(3)	West.	S.C.	1200	CS
75	West.	S.C.	900	CS
60	A.C.	S.C.	1750	
40	G.E.	S.C.	1150	MT150
30	Al.Ch.	S.C.	900	AR
30	West.	S.C.	1720 (Enc.)	CS402
30	G.E.	S.C.	1150	IK
20	Vert. G.E.	S.C.	1150	KT826
25	900 v. West.	S.C.	1750	CS183
25	Gr.Wk.	S.C.	900	

HP	Make	Wdg	Spd.	Type
25	West.	S.C.	1200	CS
20	Al. Ch. (new)	S.C.	(Hi-Tors) 1725	ARWHH
20	West.	S.C.	1725	CS
15	Gr.Wk.	S.C.	720	
15	West	S.C.	1750	CS826
15	G.E.	S.C.	1750	FY, BM
15	West.	S.C.	1750	CS826C
10	West.	S.C.	1750	CS
10(3)	Al.Ch.	S.C.	575	ARY
10	West.	S.C.	1200	ARY
10	West.	S.C.	1750	CS826C
7½(3)	Al.Ch.	S.C.	575	ARY
7½	West.	S.C.	3440	CS824Y
7½	West.	S.C.	1750	CS
5	West.	S.C.	1750	CS
5/11½	G.E.	S.C.	900/1800	2S/2P
5	Reeder	S.C.	1135/57	FA
5	Sprks	S.C.	430	EM2
5	Wgh.	S.C.	1750	
3	550v. West.	S.C.	1750	CS224

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1—200 KVA. Penna. 2400v. 240 v.
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Paper Machines, Paper Mill Machinery and Converting Equipment.

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BALERS
1—Logeman Motor Driven Baler. Make bales 30 x 38 x 24.

BEATERS
2—Ditts 700 lb. Iron Tub.

BELTING—NEW
47 feet 8" 15 ply Goodyear Rubber Belting.
463 feet 6"-4 ply Silver Duck Transmission belt.
177 feet 10"-4 ply Silver Duck Transmission Belt.

CALENDER ROLLS
46 Chilled Iron Rolls—Assorted sizes.

CALENDER STACKS
1—112" face 7 roll.

COATER—Board Machine
1—Beloit Board Machine Coater. Used on 119" machine.

CONVEYOR
1—10½ ft. long x 38" wide—with motor.

CORK CUTTERS
1—Cameron with 2" x 11½" mandrels.

COUCH ROLLS—Rubber
2—152" face x 12" diameter—Ball bearing.
1—152" face x 22" diameter—Ball bearing.
3—147" face x 19" diameter.
1—140" face x 13" diameter.
1—140" face x 13½" diameter. Ball bearing.
1—137" face x 18" diameter.
1—110" face x 20" diameter. New.

CYLINDER MOLDS
1—134" face x 56" diameter, with stainless steel shafts.

DRIVES—ENCLOSED HERRING BONE GEAR
4—Falk right angle 75 hp—ratio 6.31-1.
1—Falk right angle 250 hp—ratio 7-14-1.
1—Falk straight 775 hp—ratio 1-87-1.
1—Falk straight 285 hp—ratio 3-12-1.
Above complete with clutch pulleys.

DRYERS
1—143" face x 48" diameter.
1—124" face x 48" diameter.
1—88" face x 36" diameter.
1—77" face x 60" diameter—with gear.
1—84" face x 56" diameter.
1—120" face x 19" diameter—Baby Dryer.
50—120" face x 42" diameter.
1—96" face x 36" diameter.
1—152" face x 48" diameter, with bearings.
6—120" face x 48" diameter—with gears and bearings.
3—110" face x 42" diameter with bearings and gears.
1—117" face x 42" diameter.
1—84" face x 36" diameter.
1—48" face x 48" diameter. Chrome plated with gears and bearings.
1—39" face x 18" diameter. Chrome plated with gears and bearings.
1—81" face x 36" diameter, with frames, gears and bearings.

FILTER PRESS
1—New Sperry filter press, size 12, type 41.

FILTERS
1—Oliver Vacuum Filters, Cylinder 10' face x 1'9" diameter. Steel vats.

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1—3 plate Sandy Hill Better Shoe with scrapers.
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1—Harmon 12 plate.
1—Sandy Hill 12 plate roller shoe.

FOURDRINIER SECTIONS
1—F & J 100" x 60 ft. ball bearing. Complete from inlet to 22" diameter suction couch. Brass and Rubber covered table rolls. 6 Brass Suction Boxes operated at 1000' per minute.

JORDANS
1—96 Niagal, for motor drive.
1—Jones Majestics with base and couplings—
1—93 Appleton with base and coupling.
1—Jones Majestic. Stainless Steel Fitting.

LAMINATOR
1—Downingtown 82" Laminator.

MOTORS
1—General Electric 150 h.p. vertical motor—1200 r.p.m., 440 v., 3 phase, 60 cycle.
1—(4) G. E. 75 h.p. vertical motor, 1200 r.p.m., 440 v., 3 phase, 60 cycle.

PULP EQUIPMENT
1—Mitts & Merrill #12 Pulpwood chipper.
1—Trimbey pulp screen with scraper.
1—Waterous 3 pocket grinders, 22" wood. Complete with load regulators, speed regulators, motors and starters. Latest type. Used 2 years.
1—Bird ball bearing Pulp Screen. Practically new. Used 6 months.
5—AP&W 6" Ball Bearing Pulp Screens—60 ton capacity.

PULPERS
2—82 Lamoyo with enclosed Falk Drives. New.

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44—Centrifugal Pumps, open & closed impellers. Direct connected or Belt Driven. Extended base for motor. Assorted capacities and heads. Most used less than one year. Also new Gaskis Pumps.

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ROLLS—PRESS, COUCH, etc.
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ROTARY SCREENS
4—52A Bird, fully rebuilt with new vats, plates, etc.—enclosed drive.
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1—72 Bird—iron vat.

SAVEALLS
3—Oliver, Vacuum type cylinder 120" face x 60" diameter.

SCREW PRESSES
1—Valley Voith Screw Press Size 2A, with new spare sets of plates.

SHEETERS
1—Finlay 90" with 6 roll back stand, motor and 4 slitters.
1—42" Dilts with 8 roll backstand.
1—44" Kidder Boot Sheeter.

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1—American 37" Hamermill, anti-friction bearing.
1—Sprout Waldron Cutter—type F-11—30" knives. Used 30 days.

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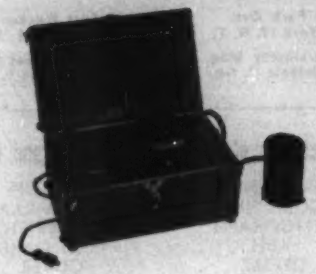

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The Brown Instrument Co.

CONTROLS
Askania Regulator Co.
The Bristol Company
The Brown Instrument Co.
Johnson Corp.
Shartle Bros. Mch. Co.
Stickle Steam Specialties Co.

CONVERTING MACHINERY
Egan, Frank W., & Co.
John Waldron Corp.
Dilts Machine Works
Hudson-Sharp Machine Co.

CONVEYORS
Black Clawson Company
Industrial Brownhoist Corp.
Link Belt Company
Murray, D. J., Mfg. Co.
Ross Engineering Corp., J. O
Shartle Brothers Mch. Co.

CORES
Elixman Paper Co.
Rodney Hunt Machine Co.
Smith & Winchester Mfg. Co.
Sonoco Products Co.

CORROSION RESISTANT
Ameresist Corporation

COTTON LINTER
Railway Supply & Mfg. Co.

COUPLINGS
Black Clawson Company
Farrel-Birmingham Co., Inc.
E. D. Jones & Sons Co.
Link Belt Company
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Thomas Flexible Coupling Co.
Valley Iron Works
Waldron Corp., John

CRANES
Cleveland Crane & Engrg. Co
Industrial Brownhoist Corp.
Link Belt Company
Whiting Corp.

CURL TESTER
Thwing-Albert Instrument Co.

CUTTERS
Black Clawson Company
Dilts Machine Works
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Harris-Seybold Co.
Moore & White Co.
Perkins & Son, Inc., B. F.
The Sandy Hill Iron & Brass Works
The Smith & Winchester Mfg Co.
Taylor, Stiles & Co.

CYLINDER MOULDS
Manchester Machine Co.

CYLINDERS
M. W. Jenkins Sons, Inc.
National Tube Co.

DAMPENERS
Perkins & Son, Inc., B. F.
Valley Iron Works Co.

DECKLE WEBBING
Williams-Gray Co.

DEFIBRATORS
American Defibrator Co.

DE-INKING
The Cowles Company
Dilts Machine Works
General Dyestuff Corp.
Kinsley Chemical Co.
Roderick O'Donoghue
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

DEINKING CHEMICALS
E. I. Du Pont De Nemours & Co., Inc.
General Dyestuff Corp.
Kinsley Chemical Co.
Monsanto Chemical Company
Nopco Chemical Co.

DE-MINERALIZING EQUIPMENT
Hungerford & Terry, Inc.
The Permutit Company

DEMULSIFIERS
Wyandotte Chemicals Corp., Michigan Alkali Div.

DENSOMETERS
Bunge Pulp & Paper Co.
W. & L. E. Gurley

DESIGN CONSTRUCTION
Ebasco Services

DETERGENTS
American Cyanamid Company Industrial Chemicals Division
Calgon, Inc.
Cowles Chemical Co.
General Dyestuff Corp.
Monsanto Chemical Company
Nopco Chemical Co.
Rohm & Haas Co.
Wyandotte Chemicals Corp., Michigan Alkali Div.

DEWAXING CHEMICALS
American Cyanamid Company Industrial Chemicals Division
General Dyestuff Corp.
Nopco Chemical Co.

DIFFERENTIAL SCALES
Thwing-Albert Instrument Co.

DIGESTERS
Babcock & Wilcox Co.
Chicago Bridge & Iron Co.
Lukenweld
Pusey & Jones Corp.

DIGESTERS (Continuous)
Paper & Industrial Appliances

DIRTEC
Bird Machine Co.

DISPERSING AGENTS
Calgon, Inc.
General Dyestuff Corp.
Monsanto Chemical Company
National Aluminate Corp.
Nopco Chemical Co.
Rohm & Haas Co.
Wyandotte Chemicals Corp., Michigan Alkali Div.

DOCTORS
Bird Machine Company
Black Clawson Company
Downingtown Mfg. Co.
Lobdell Co.
Lodding Engineering Corp.
The Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

DOCTOR BLADES
Bird Machine Company
Lodding Engrg. Corp
The Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

DRIERS
Black Clawson Company
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Hardinge Company, Inc.
Lukenweld
The Moore & White Co.
Murray Mfg. Co., D. J.
T. J. Rose Company
Rud-Ray Mfg. Co., Inc.
Rose Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

DRILLED SUCTION COUCH ROLLS
Manchester Machine Co.

DRILLED SUCTION DRUM ROLLS
Manchester Machine Co.

DRIVES
Allis-Chalmers Mfg. Co.
Appleton Machine Co.
Bird Machine Co.
Black Clawson Company
Dilts Machine Works
Downingtown Mfg. Co.
Fairbanks, Morse & Co.
Farrel-Birmingham Co.
General Electric Company
Gibbs-Brower Company, Inc.
Rodney Hunt Machine Co.
Link Belt Company
Moore & White Co.
Murray, D. J., Mfg. Co.
Pusey & Jones Corp.
T. J. Rose Company
Rose Paper Machy. Corp.
The Sandy Hill Iron & Brass Works
Shartle Bros. Mch. Co.
Valley Iron Works Co.
Westinghouse Electric Corp.

DRUM WINDERS
Manchester Machine Co.

DRYER DRAINAGE
Stickle Steam Specialties Co.

DRYER ROLL PYROMETER
Thwing-Albert Instrument Co.

DUSTERS
Appleton Machine Co.
Downingtown Mfg. Co.
Frank W. Egan & Co.
M. W. Jenkins Sons, Inc.
E. D. Jones & Sons Co.
Moore & White Co.
D. J. Murray Mfg. Co.
John Waldron Corp.

DUSTING BRUSHES
M. W. Jenkins Sons, Inc.

DYESTUFFS
American Cyanamid Company. Calco Chemical Div.
Bunge Pulp & Paper Co.
Ciba Company
E. I. du Pont de Nemours & Co., Inc.
Geigy Co., The
General Dyestuffs Corp.
National Aniline Division, Allied Chemical & Dye Corp.

ELECTRIC HYGROMETER
Thwing-Albert Instrument Co.

EMBOSSING MACHINES
Dilts Machine Works
Egan, Frank W., & Co.
John Waldron Corp.

EMBOSSING ROLLS
The Appleton Machine Co.
Gibbs-Brower Company, Inc.
Northern Engraving & Mch. Co
B. F. Perkins & Son, Inc.
John Waldron Corp.
Wheeler Roll Co.

EMULSIFIERS
General Dyestuff Corp.
Nopco Chemical Co.
Rohm & Haas Co.
Wyandotte Chemicals Corp.

ENZYMES
Rohm & Haas Co.
Vanderbilt Co., R. T.
Wallerstein Co., Inc.

EVAPORATORS
Davis Engrg. Corp.
Goslin-Birmingham Mfg. Co., Inc.
Murray, D. J., Mfg. Co.
Swenson Evaporator Co., Div. of Whiting Corp.

EXPANDERS
Mount Hope Machinery Co.

FANS
General Electric Co.
B. F. Perkins & Son, Inc.
Ross Engineering Co., J. O.

FEEDERS
Hardinge Company, Inc.
Leeds & Northrup
Merrick Scale Mfg. Co.
The Permutit Company

FELTS
Appleton Woolen Mills
Asten-Hill Mfg. Co.
Draper Bros. Corp.
Hurch & Son, F. C.
Lockport Felt Co.
Mercy Paper Mill Supply Co.
Shuler & Benningfield
Waterbury Felt Co.
Waterbury, H., & Sons Co.
Williams-Gray Co.

FELT CLEANERS
Calgon, Inc.
Cowles Chemical Co.
General Dyestuff Corp.
Nopco Chemical Co.

FELT CONDITIONERS
Bird Machine Co.
The Sandy Hill Iron & Brass Works

FELT GUIDES
Black Clawson Company
Frank W. Egan & Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John

FILLERS
American Cyanamid Company. Industrial Chemicals Division
A. M. Meincke & Son, Inc.
Vanderbilt Co., R. T.
Wyandotte Chemicals Corp., Michigan Alkali Div.

FILTERS
Bird Machine Company
Green Bay Fdy. & Mch. Co.
Hardinge Company, Inc.
J. M. Huber Corp.
Hungerford & Terry, Inc.
Johnson Corp.
Moore & White Co.
J. O. Ross Engrg. Corp.
The Sandy Hill Iron & Brass Works
Walworth Company

FITTINGS
Crane Company
Shartle Bros. Mch. Co.
Walworth Company

FLEXIBLE COUPLINGS
Egan, Frank W., & Co.
Lovejoy Flexible Coupling Co.
John Waldron Corp.

FLOORING, GRATING AND TREADS
The Goodyear Tire & Rubber Company
Nurnes Co.

FLOW BOXES, STAINLESS-CLAD
Lukens Steel Co.
The Sandy Hill Iron & Brass Works

FORK LIFT TRUCKS
Tournotor Corp.

FORMATION TESTERS
Thwing-Albert Instrument Co.
Williams Apparatus Co., Inc.

FORMING MACHINES
Black Clawson Company
Downingtown Mfg. Co.
The Moore & White Co.
Noble & Wood Machine Co
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

FREENESS TESTERS
Testing Machines, Inc.

GASKETS
The Goodyear Tire & Rubber Company

GEARS
Black Clawson Company
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
Frank W. Egan & Co.
Farrel-Birmingham Co.
E. D. Jones & Sons Co.
Link Belt Company
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Westinghouse Electric Corp.
Western Gear Works

GRINDERS
Bridgeport Safety Emery Wheel Company
Carthage Machine Co.
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
Lobdell Co.
Norton Company
Samuel C. Rogers and Company
The Sandy Hill Iron & Brass Works

GRINDING WHEELS
Norton Company

GUIDES, WEB
Egan, Frank W., & Co.
The Moore & White Co.
Mount Hope Machinery Co.
John Waldron Corp.

GUMMING MACHINES
Dilts Machine Works
Egan, Frank W. & Co.
The Sandy Hill Iron & Brass Works

GUMS
National Starch Products, Inc.
Stein-Hall Co., Inc.

HEADS
Babcock & Wilcox Co.
Lukens Steel Company

HEAT EXCHANGERS AND RECOVERY SYSTEMS
Davis Engrg. Corp.
Stickle Steam Specialties Co.
Westinghouse Electric Corp.

HEATING, VENTILATING & AIR CONDITIONING
The Appleton Machine Co.
Davis Engrg. Corp.
E. D. Jones & Sons Co.
General Electric Co.
Leeds & Northrup
D. J. Murray Mfg. Co.
Rud-Ray Mfg. Co., Inc.
Ross Engineering Corp., J. O
Stickle Steam Specialties Co.
Valley Iron Works Co.
Westinghouse Electric Corp.

HOSE (Air, Water, Suction, etc.)
The Goodyear Tire & Rubber Company

HUMECTANTS
Aktivin Division, Hayden Chemical Corp.
Nopco Chemical Co.
Wyandotte Chemicals Corp. Michigan Alkali Div.

IMPREGNANTS
American Cyanamid Company Industrial Chemicals Division
B. F. Goodrich Chemical Co.

INDENTING MACHINES
Dilts Machine Works

INDUSTRIAL TRACTORS
Tournotor Corp.

INKOMETER
Thwing-Albert Instrument Co.

INSTRUMENTS, TESTING AND MEASURING
Bauer Brothers Co.
Beckman Instruments, Inc.
Bunge Pulp & Paper Co.
N. P. Bowsher
General Electric Company
W. & L. E. Gurley
National Technical Laboratories
B. F. Perkins & Son
Photovolt Corp.
Taylor Instrument Cos.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Williams Apparatus Co.

JOINTS
Johnson Corp.
Lovejoy Flexible Coupling Co.
Shartle Bros. Mch. Co.

JORDAN FILLINGS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
E. D. Jones & Sons Co.
Shartle Bros. Mch. Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

KNIVES
Black Clawson Company
Dilts Machine Works, Inc.
Hamblet Machine Co.
Heppenstall Company
E. D. Jones & Sons Co.
The Moore & White Co.
Taylor Stiles & Co.
Valley Iron Works Co.

KNOT BORING MACHINES
DeZurik Shower Company

KRAFT WRAPPING PAPERS
Canadian Newsprint Supply Co.

LABORATORY CORRUGATOR
Thwing-Albert Instrument Co.

LABORATORY EQUIPMENT
Appleton Machine Co.
Bauer Brothers Co.
Beckman Instruments, Inc.
Bird Machine Company
Dilts Machine Works
W. & L. E. Gurley
Egan, Frank W., & Co.
E. D. Jones & Sons Co.
Leeds & Northrup Company
National Technical Laboratories

WHERE TO BUY

Taylor Instrument Companies
Testing Machines, Inc.
Valley Iron Works Co.
John Waldron Corp.
Williams Apparatus Co., Inc.

LAMINATING COMPOUND
National Wax Company

LAMINATING MACHINES
Dilts Machine Works
Egan, Frank W., & Co.
John Waldron Corp.

LAY BOYS
Dilts Machine Works
Gibbs-Brower Company, Inc.
Hamblet Machine Co.
Moore & White Co.

LINTER COTTON
Railway Supply & Mfg. Co.

LUBRICANTS
Sinclair Refining Co.
Sonony-Vacuum Oil Co.
Sun Oil Company
The Texas Company
Tide Water Associated Oil Co.

MAGAZINE REELS
Dilts Machine Works (Kohler Systems)

MATERIALS HANDLING
Cleveland Crane & Engrg. Co.
Dilts Machine Works
Industrial Brownhoist
Shartle Bros. Mch. Co.
The Wellman Engrg. Co.

MICROMETERS & CALIPERS
Farrel-Birmingham Co.
Lobdell Co.
Testing Machines, Inc.

MICRO-CRYSTALLINE WAXES
Bunge Pulp & Paper Co.
Moore & Munger
National Wax Company

MOISTURE CONTENT CONTROL
Stickle Steam Specialties Co.
Williams Apparatus Co., Inc.

MOTORS AND GENERATORS
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.
General Electric Company
Reliance Electric & Engrg. Co.

NEWSPRINT
Bunge Pulp & Paper Co.
Canadian Newsprint Supply Co.

NICKEL AND NICKEL ALLOYS
The International Nickel Co.

NOZZLES
Link Belt Company

PACKING BOXES
Johnson Corporation
The Moore & White Co.
Shartle Brothers Machine Co.

PAPER CONDITIONING
Vapo Systems Co.

PAPER MACHINE DRIVES
Manchester Machine Co.

PAPER MACHINES
Bagley & Sewall Co.
Black Clawson Company
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Lukenweld
Moore & White Co.
Pusey & Jones Corp.
J. J. Ross Company
Ross Paper Machy. Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

PAPER MACHINE SLICES
Black Clawson Company
E. D. Jones & Sons Co.
The Moore & White Co.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

PAPER TUBE MACHINERY
Dietz Machine Works
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Hudson Sharp Machine Co.
Langston Co., Samuel M.

PARAFFINE WAXES
Moore & Munger
National Wax Company

PARAFFIN WAX EMULSIONS
Nopco Chemical Co.

PASTING MACHINES
Black Clawson Company
Dilts Machine Wks.
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Murray, D. J., Mfg. Co.
Moore & White Co.
Pendevin Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John

PEBBLE MILLS
F. L. Smidth & Co.

PERFORATED METAL
Allis-Chalmers Mfg. Co.

PETROLATUMS
National Wax Company

pH METERS
Thwing-Albert Instrument Co.

PIPE
Armco Drainage & Metal Products, Inc.
Babcock & Wilcox Co.
Crane Company
Michigan Steel Casting Co.
National Tube Co.
Walworth Company

PIPE FITTINGS
Armco Drainage & Metal Products, Inc.
Crane Company
Michigan Steel Casting Co.
Walworth Co.

PIPE MARKERS
W. H. Brady Co.

PITCH CONTROL
American Cyanamid Company Industrial Chemicals Division
General Dyestuff Corp.
Monsanto Chemical Company
National Aluminate Corp.
Nopco Chemical Co.
Rohm & Haas Co.

PLASTICIZERS
American Cyanamid Company Industrial Chemicals Division
Aktivin Division, Heyden Chemical Corp.
B. F. Goodrich Chemical Co.
Nopco Chemical Co.

PLATERS
Gibbs-Brower Company, Inc.
Perkins & Son, Inc., B. F.

PLATES
Armco Steel Corp.
Babcock & Wilcox Co.
J. O. Ross Engrg. Corp.
Lukenweld Division
Lukens Steel Company
Timken Roller Bearing Co.

PLUGS
The Appleton Machine Co.
Black Clawson Company
E. D. Jones & Sons Co.
Shartle Brothers Machine Co.

POPE TYPE REELS
Egan, Frank W., & Co.
Manchester Machine Co.

PRECISION SAMPLE CUTTER
Testing Machines, Inc.
Thwing-Albert Instrument Co.

PRESERVATIVES
E. I. du Pont de Nemours & Co.
General Dyestuff Corp.

PRESSURE VESSELS STEEL AND ALLOY
Babcock & Wilcox Co.

PRESSURE VESSELS
Chicago Bridge & Iron Co.

PRESSES
Black Clawson Company
Dietz Machine Works
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Hudson-Sharp Machine Co.
The Moore & White Co.
Pendevin Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.
Waldron Corp., John
H. G. Weber & Co., Inc.
Williams Apparatus Co.

PULLEYS
Lovejoy Flexible Coupling Co.

PULP CLASSIFIER
The Bauer Bros. Co.
Thwing-Albert Instrument Co.

PULP CLEANERS
Nichols Engrg. & Research Corp.

PULP STOCK VALVES
Crane Company
Record Fdy. & Mach. Co.
Shartle Brothers Machine Co.

PULPERS
Apmew, Inc.
Bauer Brothers Co.
The Cowles Company
Dilts Machine Works
E. D. Jones & Sons Co.
Shartle Brothers Machine Co.

PULPS
Brown Company
Bunge Pulp & Paper Co.
Gottesman & Co., Inc.
Lyddon & Co. (America), Inc.
Parsons & Whittemore, Inc.
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp and Paper Trading Co.
Restigouche Co., Ltd.

PULPSTONES
Norton Company

PULP TESTERS
Paper and Pulp Testing Laboratories
Williams Apparatus Co., Inc.

PULVERIZING MILLS
F. L. Smidth & Co.

PUMPS
American Paper Machy. & Engrg. Works, Inc.
Allis-Chalmers Mfg. Co.
Black Clawson Company
DeLaval Steam Turbine Co.
Dorr Company
Downingtown Mfg. Co.
Fairbanks, Morse & Co.
Gibbs-Brower Company, Inc.
Johnson Corp.
Moore & White Co.
Nash Engineering Co.
Roots Connersville Blower Corp.
J. J. Ross Company
Ross Paper Machy. Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

RADIANT BURNERS
Red-Ray Mfg. Co., Inc.

RAG COOKING PROCESSES
The Kinsley Chemical Company
General Dyestuff Corp.
Rohm & Haas Co.

RAG CUTTERS
Gibbs-Brower Company, Inc.
B. F. Perkins & Son, Inc.
Taylor-Stiles & Co.

RECAUSTICIZING PLANTS
The Dorr Company

RECOVERY SYSTEMS
Babcock & Wilcox Co.
Chicago Bridge & Iron Co.
Rodney Hunt Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Pusey & Jones Corp.
Ross Engineering Corp., J. O.
Valley Iron Works Co.

REELS
The Appleton Machine Co.
Black Clawson Company
Dilts Machine Works (Kohler Systems)
Egan, Frank W., & Co.
Downingtown Mfg. Co.
Hudson Sharp Machine Co.
Moore & White Co.
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.

REFINERS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
Bauer Brothers Co.
The Cowles Company
Dilts Machine Works
Gibbs-Brower Company, Inc.
Anton J. Haug
E. D. Jones & Sons Co.
Morden Machines Co.
Murray, D. J., Mfg. Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Sutherland Refiner Corp.
Valley Iron Works

REGULATORS
American Paper Machy. & Engrg. Works, Inc.
Allis-Chalmers Mfg. Co.
Armstrong Machine Works
Bird Machine Company
DeZurik Shower Company
General Electric Co.
Johnson Corp.
Leeds & Northrup Company
National Technical Laboratories
Shartle Brothers Machine Co.
Stickle Steam Specialties Co.
Taylor Instrument Companies
Wallace & Tiernan

RESINS
American Cyanamid Company, Plastics & Resins Division
The Dow Chemical Company
B. F. Goodrich Chemical Co.
The Goodyear Tire & Rubber Company
Hercules Powder Co.
Monsanto Chemical Company
Nopco Chemical Co.
Rohm & Haas Co., Resinous Products Div.

ROLLS
Appleton Machine Co.
Black Clawson Company
Dilts Machine Works
Downingtown Mfg. Co.
Frank W. Egan & Co.
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
Lobdell Co.
The Moore & White Co.
D. J. Murray Mfg. Co.
Perkins, B. F., & Sons Co.
Pusey & Jones Corp.
J. J. Ross Company
Ross Paper Machy. Co.
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
U. S. Rubber Co.
Valley Iron Works Co.
Waldron Corp., John
Wheeler Roll Co.

ROLL COVERS
The Goodyear Tire & Rubber Company
Stowe-Woodward, Inc.

ROLL HANDLING EQUIPMENT
Dilts Machine Works (Kohler Systems)

ROLL STANDS
Cameron Machine Co.
Dilts Machine Works (Kohler Systems)
Frank W. Egan & Co.
Moore & White Co.
Pendevin Machine Co.
The Sandy Hill Iron & Brass Works
John Waldron Corp.
H. G. Weber & Co., Inc.

ROPE CARRIERS
Black Clawson Co.
The Moore & White Co.
The Sandy Hill Iron & Brass Works

ROTARY KILNS
F. L. Smidth & Co.

ROTARY STEAM JOINTS
Johnson Corp.
The Moore & White Co.
Shartle Bros. Mch. Co.

RUBBER PRODUCTS
The Goodyear Tire & Rubber Company

SATURANTS
B. F. Goodrich Chemical Co.

SATURATING MACHINES
Dilts Machine Works
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Moore & White Co.
Pendevin Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman G.

SAVEALLS
Bird Machine Company
Chicago Bridge & Iron Co.
Green Bay Fdy. & Mch. Wks.
Hardinge Company

SCALES
Fairbanks, Morse & Co.
Merrick Scale Mfg. Co.
Testing Machines, Inc.

SCREEN PLATES
Bird Machine Company
Fitchburg Screen Plate Co.
Magnus Metal Corp.
Morey Paper Mill Supply Co.
Testing Machines, Inc.

SCREENS
Allis-Chalmers Mfg. Co.
Appleton Wire Works
Appleton Machine Company
Bird Machine Company
Carthage Machine Co.
The Cowles Company
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Green Bay Fdy. & Mch. Co.
E. D. Jones & Sons Co.
Link Belt Company

Moore & White Co.
D. J. Murray Mfg. Co.
J. J. Ross Company
Ross Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

SHEET MACHINES
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Valley Iron Works Co.
Williams Apparatus Co., Inc.

SHOWER PIPES
Bird Machine Company
DeZurik Shower Company
Downingtown Mfg. Co.
Moore & White Co.
Sandusky Fdy. & Mch. Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

SHREDDERS
Bauer Brothers Co.
Carthage Machine Co.
Gibbs-Brower Company, Inc.

SIZE PRESSES
Manchester Machine Co.

SIZING
American Cyanamid Company, Industrial Chemicals Division
The Dow Chemical Company
du Pont, E. I., de Nemours & Co.
Hercules Powder Co.
The Hubinger Co.
Monsanto Chemical Company
National Aluminate Corp.
Nopco Chemical Co.
Stein-Hall Co., Inc.
Wyandotte Chemicals Corp., Michigan Alkali Div.

SIZING TESTER
W. & L. E. Gurley
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Williams Apparatus Co., Inc.

SLIME CONTROL
The Dow Chemical Company
E. I. du Pont de Nemours & Co.
General Dyestuff Corp.
Monsanto Chemical Co.
National Aluminate Corp.
Rohm & Haas Co.
Vanderbilt Co., R. T.
Wyandotte Chemicals Corp., Michigan Alkali Div.

SLITTERS
Black Clawson Company
Cameron Machine Co.
Carthage Machine Co.
Dietz Machine Works
Dilts Machine Works
Downingtown Mfg. Co.
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Thomas W. Hall Co., Inc.
Hamblet Machine Co.
Hudson Sharp Machine Co.
Langston Co., Samuel M.
Moore & White Co.
D. J. Murray Mfg. Co.
Potdevin Machine Co.
J. J. Ross Company
Ross Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

SMOKE STACKS
Chicago Bridge & Iron Co.

SOFTNESS-STIFFNESS TESTER
W. & L. E. Gurley
Testing Machines, Inc.
Thwing-Albert Instrument Co.

SOLUBLE OILS
American Cyanamid Company, Industrial Chemicals Division
General Dyestuff Corp.
Nopco Chemical Co.

SPECIAL MACHINERY
Dilts Machine Works
Egan, Frank W., & Co.
The Sandy Hill Iron & Brass Works
John Waldron Corp.

SPLICING TISSUE
Bunge Pulp & Paper Co.
Williams-Gray Co.

STAINLESS STEEL
Armco Steel Corp.
Michigan Steel Casting Co.
U. S. Steel Corp.

STARCH
A. M. Meincke & Son, Inc.
Clinton Foods, Inc.
The Hubinger Co.
National Starch Products Inc.
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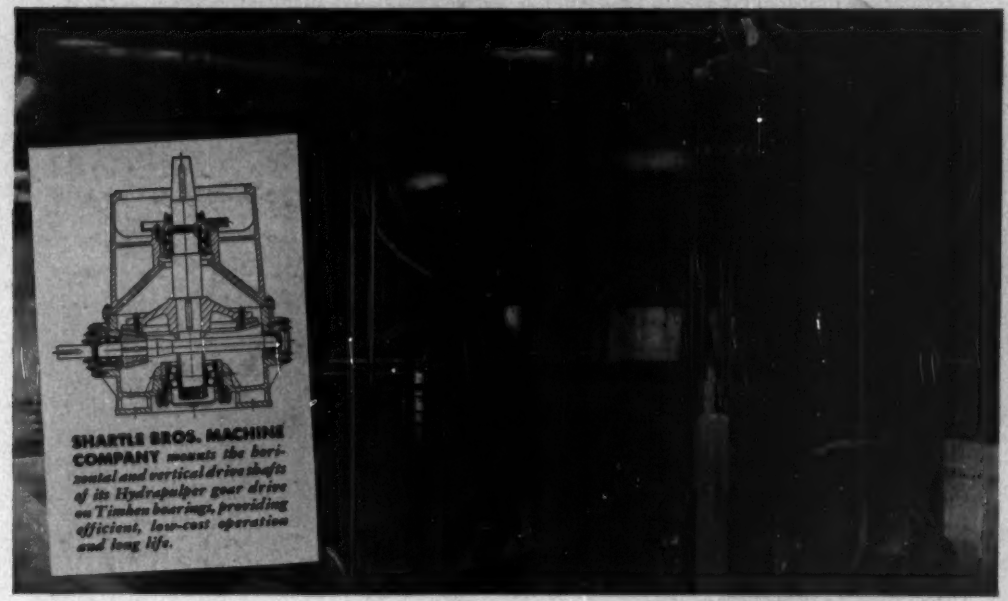

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